JANUARY 1957

Approach

NAVAER 00-75-510

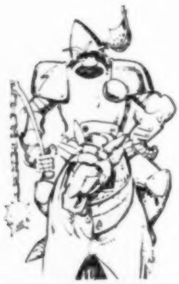
THE NAVAL AVIATION SAFETY REVIEW

Approach

Vol. 2
No. 7

Published by U. S. Naval Aviation Safety Center

IN THIS ISSUE



This periodical contains the most accurate information currently available on the subject of aviation accident prevention. Contents should not be construed as regulations, orders or directives unless so stated. Material extracted from Aircraft Accident Reports, OpNav Form 3750-1 and Anymouse (anonymous) Reports may not be construed as incriminating under Art. 31, UCMJ. Names used in accident stories are fictitious unless stated otherwise. Photo Credit: Official Navy or as credited. Original articles may be reprinted with permission. Contributions are welcome as are comments and criticisms. Address correspondence to Director, U. S. Naval Aviation Safety Center, NAS Norfolk 11, Va.

Printing of this publication approved by the Director of the Bureau of the Budget, 9 Dec 1954.

Published monthly, this magazine may be purchased from the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. Single copy 30 cents; 1-year subscription $2.50; 75 cents additional for foreign mailing.

Cover photo by R. A. Genders

Worth 10,257 Words

Without resorting to heavy-handed symbolism, we've tried, in this month's cover, to picture the simple elements of what the New Year holds for all of us in naval aviation.

First, there is posed for us the very real and continuing problem of operating the Navy's air arm, with its increasing complexity of equipment, through the next 12 months in a *safely* effective manner.

Mark that well, for statistics disclaim any misguided notion that the mission can be accomplished efficiently at the expense of safety, *i.e.*, you don't get availability from busted airplanes.

Along with the problem we offer the basis for the answer, and while we don't presume to place the entire responsibility on the shoulders of the Aviation Safety Officer, there is clearly indicated the tremendous potential of the aviation safety program he represents.

Because both the problem and the answers are to be found within the flight activities themselves, you'll note that *Approach* has modestly made itself so unobstrusive that you'll have to squint to find it in the picture. That's the picture, the problem and the solution, as we see it, for the New Year, and any year.

The title? We're advised that the current market value of a picture is 10,000 words—we've added 257 to speak our piece. And if you're the slogan type, perhaps you'll approve, and then prove that "Planning, Prudence and Professionalism" will be the magic words to make 1957 the most successful year in the history of naval aviation.

IN THIS ISSUE

Letters to the Editor

Sir:
In answer to Captain I. J. Schwartz' letter last July you mentioned a plane captain's handbook issued by VA-86. I am a plane captain in a reserve patrol squadron and this does not allow me full time to keep up with the latest and best ways of executing my job; so, I would like to get one of these books. Is it possible to get one through you or must I get it from VA-86? If I have to contact VA-86, please supply me with the address.

GEORGE N. KIRIAKOS, ADF2
VP-922, Lambert Field, St. Louis

VA-86, FPO, N. Y., N. Y., produced a mighty fine F7U-3 plane captain's handbook. We've heard VP-49, also FPO, N. Y., N. Y., who have followed suit with the production of a P5M plane captain's handbook.—Ed.

Sir:
With reference to the solution offered under "Slinger Stinger," October *Approach*, it is suggested that relying on a nervous passenger to remember to keep a strain on the hook while he has other problems in mind may have unfortunate results.

The following mechanical corrections are suggested instead:

Relocate and/or redesign the snatch hook latch so that the distance from the interior of the lifting area to the end of the hook is greater than the maximum internal dimension of the D-ring. This problem can be simplified by welding on the end of the standard hook.

The free end of the latch shown in photo "A" is sufficiently blunt so that there might be a possibility of the D-ring wedging it open from inside. Proper tapering of the latch would correct this.

It is believed that appropriate sketches provided operating activities would permit making these alterations locally.

L. T. MORSE
Embassy of the United States of America
Office of the Naval Attache—Moscow

We concur. Suggestions forwarded post-haste to BuAer. The Center is currently collecting all available operational helicopter recovery technique and equipment information. Activities are requested to forward appropriate info, photos and doctrine for a possible Approach *article, or Sense Pamphlet.—Ed.*

Sir:
Here is a picture of the NARTU Anacostia Safety Literature "read board." The main body of the board is a piece of ⅝" plywood, 4' x 6', within a two-inch frame. The magazine holders are sheets of ⅛"

plexiglas, four feet long and ten inches high, notched at intervals to facilitate removal of the magazines. The plexiglas is held away from the plywood backing by half-inch stripes which also serve to form partitions between the magazines.

L. E. HARMON
Commanding Officer

Thanks. Nicest we've seen so far.—Ed.

More on next page

Letters to the Editor continued

Sir:

I have been involved in NACA's helicopter research as a pilot since 1944. I have recently read Al Bott's article on "Power Settling" in the September issue of your *Approach* magazine. Although the article is very plausible from the operational standpoint it refers to stalling of the blades during power settling.

This reference to stalling has prompted me to write you since our early flight tests showed that stalling does not occur in this flight condition. This knowledge might strongly influence a pilot's use of controls in taking corrective action or in recovery from a power-settling condition.

NACA Technical Note No. *1799*, pages 8 and 9, mentions tests in which the blades were covered with yarn tufts and a camera rotating on the hub photographed the action of these tufts during power settling conditions. During even the most violent cases the tufts gave no indication of stalling. Also, the stick forces with the simple, mechanical-control systems of that period did not indicate the presence of stalling.

Actually the average angle of attack of the blades for typical present-day helicopters is roughly only half of that for the stall during power settling over a fairly wide range of altitudes and weight and the variation in angle of attack along the effective span of the blade is only a few degrees.

Wind-tunnel studies made in Holland and at NACA Langley have shown that in this flight regime large vortex formations exist in the flow through the rotor and they are highly unstable with respect to position, i.e., the vortices shifted back and forth from one side of the rotor disc to the other thus giving rise to shifting of the rotor thrust vector and to rotor roughness (TN 1799).

Furthermore, the British, from their observations during flight tests, concluded that some of the more violent motions of the helicopter are caused by the effects of the shifting vortex flows on the fuselage of the helicopter and that some fuselage shapes were affected far more than others. We tend to agree with their observations.

Power settling occurs in the so-called vortex-ring mode of operation of the rotor. This mode occurs when there is a resultant average flow velocity of about zero through the rotor; i.e., when the downward flow through the rotor induced by its thrust is approximately equal to the upward flow resulting from the sinking velocity of the helicopter. Within this mode of operation, which roughly encompasses rates of descent from 300 to 1500 feet per minute, for typical helicopters, there is a range of rates of descent where the downward flow of air through the rotor induced by a thrust increase caused either by a pitch change or by an increased rate of descent increases more rapidly than does the flow up through the rotor due to the sinking velocity of the helicopter.

This actually results in the rotor blade angles of attack being reduced and the rotor unloading itself through this range of rates of descent. This is the reason for the helicopter settling faster once it enters this region even though pitch is added, and is also the reason for the rotor over-speeding.

The article refers to power settling and stalling as the cause for the strong nose-up tendency of some tandem types at low speed. It appears that this nose-up tendency results primarily from an instability due to downwash interference at the rear rotor. The instability is most pronounced for a narrow range of intermediate powers. While reducing speed from that for minimum power (40 Knots in a typical case) the instability results in increasing forward control down to very low speed. At even lower speeds (less than 10-15 Knots) the instability disappears and the control moves back toward neutral for trim if it is possible to get beyond the point where maximum forward control is required. With cruise power, a rate of descent will have developed at speeds near zero, and the helicopter will enter the vortex-ring regime where behavior similar to that of single-rotor helicopters does occur.

In the fully developed case, with vertical descent, the longitudinal control returns to near neutral. Recovery from the fully-developed stage is similar to that for single-rotor helicopters. It might be pointed out that because of the downwash from the front rotor the rear rotor is actually operating further from the vortex-ring state than the forward one as the speed is approaching zero.

To get back to the point, although the discussion in the article is excellent from the standpoint of the overall effects, the concept of stalling may lead to erroneous conclusions as to the use and effectiveness of the controls for recovery. Cycle control should still retain an average effectiveness.

In the tandem type where differential collective pitch is used for longitudinal control vortex-ring flow conditions may be aggravated during recovery from some stages of difficulty when using this control.

If the vortex-ring region of operation is just being entered by slowly increasing rates of descent it is sometimes possible to recover by immediately applying additional pitch and power, if available, since stalling is not imminent.

If well into the region however, flying out by increasing speed in one direction or another is the best means of recovery, as stated, although if a great excess of power were available it might be possible to check the rate of descent by a continuous and rapid change of pitch through a large range.

It might also be pointed out that power-on vertical descent, at rates of descent greater than these where vortex-ring difficulties occur, is also possible. For instance, in our tests of TN No. 1799 most vortex-ring explorations were entered at about 500 feet per minute rate of descent with zero forward speed and no steady condition could be held between this rate of descent and about 1500 feet per minute. Between 1500 feet per minute and vertical autorotation where a rate of descent of 2500 feet per minute was attained, however, no difficulties were encountered. Thus, reducing pitch is effective for recovery if altitude permits.

As a word of caution I wish to add that my discussion above applies only to very low forward speeds since the flight phenomena discussed have not been encountered in our explorations at speeds over 15 Knots, roughly.

JOHN P. REEDER
Chief Pilot & Head,
Flt. Operations Br.
Flight Research Division
NACA, Langley Field, Va.

Excellent points. Thanks for your interesting summation, Mr. Reeder. Approach *has since visited NACA on this and other rotary wing subjects, and will bring additional info to the attention of helicopter units as appropriate.—Ed.*

Sir:
Attack Squadron 146 wishes to commend those responsible for the Operational Flight Trainer Program and to express appreciation for the invaluable services rendered to the pilots of this squadron by the OFT personnel stationed at NAS Miramar.

The OFT program has considerably shortened the familiarization and indoctrination period of pilots new to both the F9F-6 and -8 aircraft which were received by this newly commissioned squadron.

In three major instances it is considered that aircraft or pilots have been saved due to the fact that emergency procedures had been thoroughly learned in the OFT.

E. V. DAVIDSON
CO. VA-146

Bouquets to the OFT and the operators. Far too often, this expensive safety device doesn't get the use it deserves. We'd like more of this from fleet squadrons . . . meanwhile, hope you can keep your accidents from ever happening!—Ed.

Sir:
. . . "As your safety magazine *Approach* contains many excellent articles and suggestions pertaining to aviation I am wondering if I could secure blanket authority to reproduce some of this material for use within our organization by our pilot personnel.

I am interested in two specific articles in the October issue: "Knee Pad Notes" and "Airman's Almanac". If you cannot approve blanket authority, I would appreciate it very much if you could give us permission to reproduce the articles mentioned above.

C. D. KNAPP, Check Pilot
Air Transport Section
General Motors Corporation

Print away on the mentioned articles. As you know, in this printing game, an error sometimes escapes detection until after it's in print. To preclude compounding of such errors NASC perfers a check be made with us to insure accuracy on future articles.—Ed.

Sir:
In reference to the comment on page 23 (June *Approach*), I have a suggestion that might be of help. From the first flying phase of my training at Pensacola to the present time, it always seemed to me that flying at *even* altitudes increased the risk of collisions. For instance, I wonder how many instructors in the training command say (as mine always did) "go to 8000 and start some 180-degree turns." As a student, it is a matter of pride and precision to *hold* exactly the altitude the instructor specified.

Many times I saw other aircraft whiz by at exactly the same altitude. My suggestion is this: instead of specifying even thousands of feet, why don't they say 7200 or 6600 or some-such intermediate figure.

I notice that in the accident listed in this *Approach*, the even 25,000 feet altitude was seen again. I am sure that all operational squadrons fly at these "even" altitudes. No doubt altimeter variations account for some "stacking" but it seems to me that if commanders and individual pilots were to fly "uneven" altitudes, the likelihood of VFR collisions would markedly decrease.

A. S. MARKOVITS,
LT, MC, USNR

Any idea which offers a suggestion to reduce collision potential is well worth considering. Cags stationed in crowded areas might wait to assign intermediate levels of, say 100-200 feet to various squadrons for separation. Any other ideas?—Ed.

Sir:
First let me add my name to the long list of admirers of your magazine. It certainly rates the Pulitzer Prize for safety. But no bouquet without a brickbat.

In August you cite the obvious moral of the AD collision with the hangar doors—"Be sure those friction knobs are tight before you start the engine." Doesn't it seem even more reasonable, particularly in view of Murphy's Law, that BuAer or Douglas remedy the situation at the source—on the drawing board? Is there any requirement that an engine develop full power on start? It gets a little hard on hangar doors, obviously . . .

W. C. CHAPMAN
LCDR, VA-63

Since "Knob Hob" in the August Approach, *a second report indicates "it" gets hard on Quonset huts too. This too, was a case of an inexperienced plane captain at the controls when a full power start developed. This caused the AD-5 to jump its chocks and plow into a Quonset hut.*

BuAer and the manufacturer have been apprised of the less-than-best throttle mechanism design in AD aircraft. In the meantime, it is suggested that the following item from the Pilot's Handbook be added as item No. 2 to the "Engine Operating Instructions" checklist which is already installed in the cockpit of ADs:

". . . Set throttle for approx, 1200 RPM and TIGHTEN FRICTION CONTROLS."—Ed.

Sir:
It is my belief that the present publication and distribution of the *Approach* saves hundreds of thousands of dollars, perhaps more, each year in the prevention of aircraft accidents alone. What would be a fair estimate of the number of aviators being reached each month by a copy of this magazine? 55%? 65%? A larger number?

Anyhow, if you were to increase this number to say—99 44/100%, how much would the savings on aircraft accidents *increase?*

It is my guess it would easily pay for a free subscription of *Approach* magazine to be sent, automatically, to each and every Naval Aviator from the time he gets his wings, to continue as long as he remains on active duty.

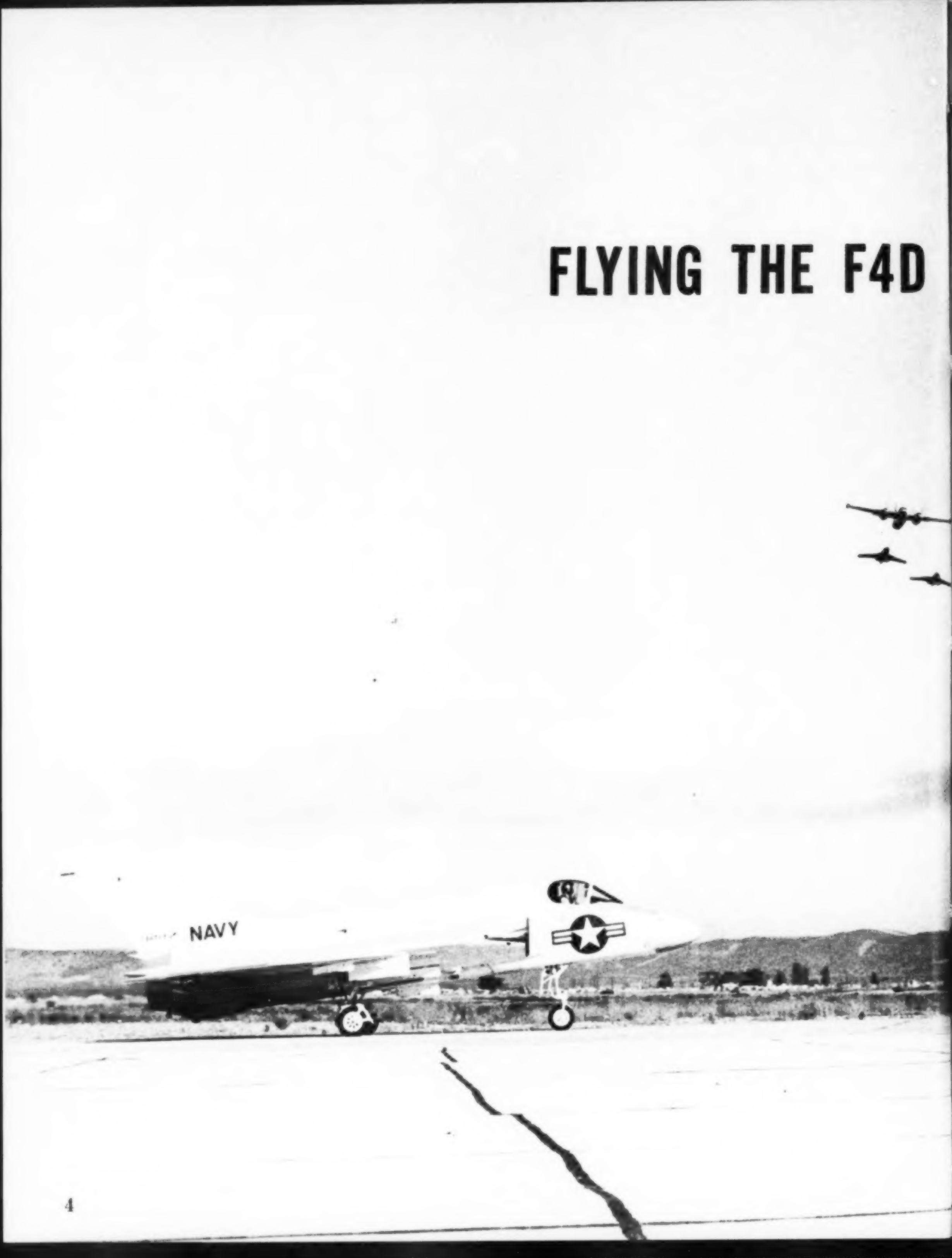
For greatest effectiveness, of course, his copies must follow him to his new duty station, one way or another. This plan would ensure a much greater number of aviators actually reading *all* the good dope instead of glancing through the "office copies," looking at pictures and sketchily reading the more interesting (as he sees it) articles.

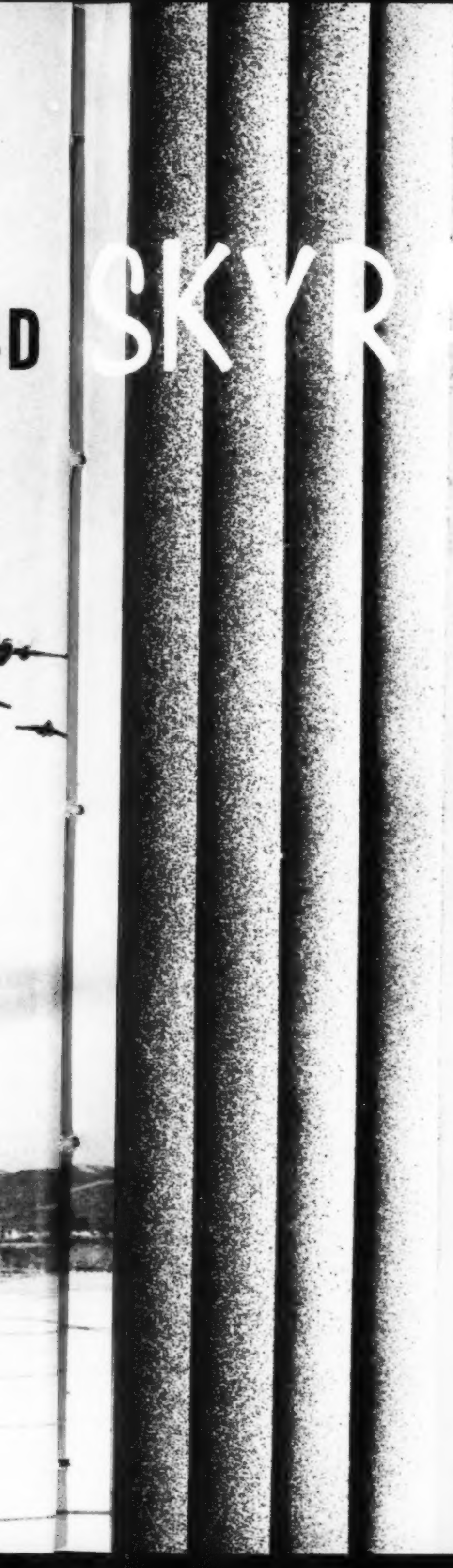
How about it?

LT G. A. BOGGS
BTG-3S Safety

Sorry, but we're printing all copies allowed by BuAer's budget at the moment. Some day a greater number may be authorized. Adjustments can be made in quantities sent to some units, however. In the meanwhile, a positive display and routing system in your unit may be the answer. While we've had other complaints from pilots, the aircrewmen and mechs seem to have the hardest time getting hold of copies. Please make sure that some of your current ration gets to them! Incidentally, the Government Printing Office reports that since they placed Approach *on sale that a large percentage of the paying subscribers are active duty Navy, Air Force and Army aviation personnel.—Ed.*

FLYING THE F4D





D SKYRAY IN THE PATTERN

By Robert E. (Bob) Drew

Experimental Engineering Test Pilot
Douglas Aircraft Company, Inc.

FOR the benefit of those who are not familiar with the *Skyray*, let's briefly discuss the airplane itself. The F4D is characterized by a large area delta wing with the absence of the conventional empenage. The power plant used in the airplane is the Pratt and Whitney J-57-P8A or -P8, a twin-spool axial flow turbo-jet with afterburner, which, I might add, is one of the best jet engines I have ever flown. The engine is very cool running with excellent starting characteristics both on the ground and in the air.

Although I wouldn't advise a pilot to do this habitually, we have made many jam accelerations and sharp decelerations in and around the traffic pattern, with very satisfactory results, so it can be done in case of emergency.

The controls of the F4D are hydraulically-actuated and incorporate an artificial feel system. The control system consists of two independent 3000-lb. irreversible supplies, (elevon and utility). The control surfaces serve as both ailerons and elevators, thus the name "elevons." The elevons are actuated symmetrically for

Continued

FLYING THE F4D *SKYRAY* IN THE PATTERN

Continued

First of all, flying the F4D on the manual control system is considerably different than flying on hydraulic control in that stick forces are very high.

elevators and asymmetrically for ailerons. A mechanical disconnect is provided, by which a pilot may completely disconnect the hydraulic power supply from the control surfaces, in the event of a complete failure of both systems, which I will cover in more detail later on.

A split rudder is incorporated in the F4D, the bottom half of which is mechanically actuated by use of the rudder pedals. The top half, or servo rudder, which slaves with manual rudder, also serves as a combination yaw damper and directional trimmer. When electrical power is turned off by means of the emergency yaw damp switch on the left console, hydraulic power to the servo rudder is shut off and it then trails as a function of air loads.

There is a mechanical advantage changer system (MCAS) employed in the airplane which primarily serves to reduce the sensitiveness of the control system at high airspeed and low altitude. The MCAS is electrically operated (AC) and is automatically programmed as a function of mach number and altitude (density of the air). It can also be operated manually from the cockpit by means of a hand crank. This system consists of a bellcrank located in each wing and by simple geometrics, changes the ratio of stick deflection to control surface displacement laterally and longitudinally, from a ratio of 1:1 to 3:1. As an example, with the MCAS at 1:1 full lateral stick deflection would displace each elevon approximately 20° of aileron travel. With the MCAS at 3:1, an elevon displacement of only 7° of aileron travel would occur with full lateral stick deflection.

As for the trim systems incorporated in the airplane, I have already mentioned the directional trim which is actuated by a knob on the left-hand console. The lateral and longitudinal trim is actuated by the conventional trim button located on the control stick grip. An emergency longitudinal trim control handle is located on the left-hand console, together with a circuit breaker toggle switch. The lateral, or aileron trim, is accomplished by simply repositioning the control stick and is operated by AC power, as is the directional trim. The longitudinal trim is accomplished by means of pitch trimmers located inboard of the elevons on the trailing edge of the wing. These trimmers are interconnected and operate symmetrically only from the faired position to 30° nose up. They are electrically actuated by d.c. power and may be operated by the 28-volt battery in case of d.c. power failure.

Now that we have become familiar with some of the features incorporated in the *Skyray*, let's start out by mentioning the taxiing characteristics. The airplane is very easy and delightful to taxi and can be controlled very satisfactorily with use of the brakes. The takeoff run and liftoff in this airplane are very straight-forward, using military power. I generally use approximately 13 to 15 degrees of pitch trimmer and *crack the nosewheel off at approximately 115 knots.* From that point on, you simply relax and the airplane flys itself off. Upon gear retraction, a slight yaw may be apparent as one gear fully retracts slightly before the other gear. Upon reaching 208 knots the pitch trimmers automatically return to 6 degrees up.

Now a takeoff using afterburner is an experience which is rather unique! The thrust weight ratio of the F4D is much different than most air-

planes of its type. As a result, the acceleration is phenomenal. The airplane unofficially holds the world's record from brake release to 10,000 feet in 56 seconds, so you can see it climbs like a scalded eagle. On a cold day in the clean configuration, it is possible to break ground in as little as 800 feet.

On an afterburner takeoff, I generally use 12 to 15 degrees of pitch trimmer, and as I light off the burner, I release the brakes. If you try to hold the brakes, you'll just skid and possibly blow the tires. I usually try to get the gear coming up as soon as possible *after* I've definitely left the ground, in order to keep from exceeding the gear placard speed before retraction is complete (approximately 10 seconds). The gear placard speed above 180 knots varies depending on the amount of yaw. The limitations that apply for retraction and extension are as follows:

Velocity	Max. Angle of Yaw
180 - 200	16°
200 - 250	12°
250 - 300	8°

You'll also find that a fairly rapid rate of trim reduction is necessary on the climbout, due to the rapid acceleration characteristics.

As for flying the *Skyray* in the pattern, the first thing the new F4D pilot will notice is the heavy control forces at low airspeed. However, this is something to which a pilot can readily adjust, and they do not offer any problem once a pilot becomes accustomed to them.

Another thing the new *Skyray* pilot will be conscious of is the high angles of attack at low airspeed. This is a characteristic of a delta wing design and surprisingly enough is not the least bit bothersome to a pilot, mainly because of the excellent downward visibility afforded him.

One other thing I might mention is the rather high adverse yaw characteristics of the F4D when making a turn at low airspeed using stick alone. As in the old prop jobs, stick and rudder together is a must to turn an airplane properly. Such is the case with the *Skyray*.

Okay, let's briefly go through a landing. I like to enter the initial at about 300 knots, using about 85 to 86 percent RPM. Depending upon how I feel, the break varies from sharp to moderate, at approximately 1000 feet terrain clearance. I generally open my speedbrakes on the break to slow the airplane down to approximately 185 knots where I retract my speedbrakes. I extend my gear abeam of my intended touchdown point. Gear extension is uneventful, except for a slight right yaw, easily controlled with rudder. I like to use partial power throughout the pattern until I'm over the fence. Power-off descents in this airplane are not comfortable to the pilot as a high sink rate develops which requires a pilot to begin his flare much sooner than he is normally accustomed to; also a higher speed has to be maintained in order to complete the flare.

The pattern I try to fly after the pitch is a smooth 180-degree approach with a gradual decrease in airspeed by increasing angle of attack, not by reducing power. I usually have approximately 150 knots at the 90-degree position, dropping to 140 knots up the groove, 130 knots over the fence, with touchdown occurring at 124 knots.

In the pattern as the airspeed is decreased and the nose of the airplane rises, I gradually increase the pitch-up trim in small increments, attempting to maintain a pull force of approximately 5 to 10 pounds. I never have liked to trim an airplane to zero stick force on landing, as I don't have a positive feel of the airplane. Also, if a wave-off is necessary, you have a slight advantage in the time element involved in that there

Continued next page

There is a mechanical advantage changer system (MCAS) employed in the airplane which primarily serves to reduce the sensitiveness of the control system at high airspeed and low altitude.

FLYING THE F4D *SKYRAY* IN THE PATTERN

Continued

is less trimmer angle to reduce, which is required as the airplane accelerates.

On touchdown, I usually end up with about 12 to 14 degrees of pitch-up trim. Use of the pitch trimmer in this manner is quite essential in that a considerable amount of aerodynamic effectiveness is obtained from the trimmers. If, for instance, you should ever have to land the *Skyray* with the trimmers in the faired position (0°), the stick forces are high and full aft stick is required to hold the airplane level at approximately 135 knots. *I have landed the F4D with faired trimmers on several occasions and I simply make a little hotter and flatter approach, maintaining a minimum of 145 knots over the fence.* With this airspeed, you will come over the fence with approximately three-quarters aft stick, so you have ample stick travel left to execute the flare and touchdown.

After touchdown, I hold the nose up until the airspeed has decreased to about 80 knots. Directional control and visibility is very good with the nose up, so there isn't any reason to drop it. Holding the nose up is very effective in slowing the aircraft and saves on the brakes. Landing the *Skyray* in a moderate crosswind is no problem and you should not have any trouble.

When braking the airplane on landing roll, particularly on a hot landing into a relatively short strip, I've found that applying the brakes and holding them on for long periods of time proves to be more effective than making short applications during the rollout. This is true both with respect to stopping distance and brake cooling. This may sound strange to you, as it did to me the first time it was suggested by one of the design engineers; however, I am convinced now after having tried both methods on several occasions that what I have said of F4D is true.

The *Skyray* has excellent stall characteristics. A stall warning, as evidenced by light buffet, is apparent at approximately 125 knots, after which a high sink rate develops and buffĕt increases. At 100 knots, a yaw will occur and if allowed to continue, the airplane will fall off in a spin. I like to see patterns flown where a pilot is flying a smooth comfortable approach with a rate of descent on the order of 300 to 500 feet per minute. Avoid letting yourself get caught in the position where you end up dragging the airplane in, as this is where you can really get into trouble. If an engine failure should occur at that point, you have no out and we'll be reading about you in the papers.

Now that I've briefly covered the normal type of landing, I would like to point out the airplane's characteristics during use of the manual control system incorporated in the *Skyray*. I have some definite opinions concerning flight on this system, and I would like to convey them to you.

First of all, flying the F4D on the manual control system is considerably different than

It has been proven that adequate hydraulic power control for landing is available, providing 15 percent windmilling RPM can be maintained for flare and touchdown.

I find that the use of the rudder to control the airplane laterally is very good, as the dihedral effect (roll with yaw) is quite high with the F4D.

flying on hydraulic control in that stick forces are very high. As an example, the forces required to pull 2-Gs are on the order of 80 to 90 pounds. Naturally, with forces of this nature, the rate of control stick deflection is cut down considerably, so abrupt changes in flight using stick alone are not possible. The high forces encountered are dictated by the size of the control surfaces being subjected to air loads, as all hydraulic boost power is completely divorced from the system. Having flown the airplane quite a bit on the manual control system, I feel that it should be considered strictly as an auxiliary system, to be used only in the case of absolute necessity, tactically speaking.

As far as the disconnect is concerned, we have found that the optimum speeds to disconnect are between 170 knots and 300 knots. I generally set myself up at a speed of from 200 to 250 knots, trimmed to zero stick force, with the MCAS manually set at 2:1 and the control stick fully extended. A stick telescoping feature is provided to increase the amount of leverage available. Setting the MCAS to 2:1 helps to reduce the stick forces, approximately 50 percent from a setting of 1:1, yet still leaves enough control surface deflection to adequately control the airplane for landing.

The disconnect itself (pulling a T-handle, located on forward left side of lower instrument panel), is associated with an abrupt pitch-down of approximately 5 degrees, which can be startling, if a pilot isn't expecting it. This condition can be readily trimmed out, however, with 1 or 2 degrees of pitch trimmer and offers no problem. When flying on the manual system stay between the airspeed of 150 knots, except for final approach, and 300 knots, as the airplane is rather difficult to control above or below these airspeeds. As for the pattern and landing on manual, it simply means making a wider pattern than normal and a longer flatter final approach.

I find that use of the rudder to control the airplane laterally is very good, as the dihedral effect (roll with yaw) is quite high with the F4D. Also, the use of power is quite effective to control the attitude of the airplane. A high crosswind of 30 to 40 knots is somewhat bothersome when attempting to land the F4D on manual control and should be taken into consideration.

When landing on manual, I generally enter the initial at approximately 1200 feet terrain clearance at a speed of approximately 250 knots, and in the break I like to use a bank angle of about 20 degrees. From there, I gradually slow the airplane down to 170 knots which I maintain until I begin the final approach. On the final, I gradually slow the airplane down to 150 knots, crossing the fence at 140 knots.

I never reduce my airspeed below 130 knots on landing, as below this an overbalance condition exists and with large aft stick deflections, you might find the stick back in your lap before you want it there. Naturally, if you were still 50 feet or so in the air this could prove very disastrous. As far as longitudinal trim goes, I gradually trim the airplane all the way around the pattern maintaining a slight pull force to touchdown.

Continued next page

FLYING THE F4D *SKYRAY* IN THE PATTERN

Continued

As a final comment to this little dissertation, I highly recommend that each pilot checking out in the F4D disconnect the elevon hydraulic system at least once during the early stages of his fam hops, in order that he has a good feeling of what is available to him on manual control. Remember that you cannot return to hydraulic control once the manual control system has been selected.

Deadsticks in this airplane are not a great deal different from other sweptwing airplanes other than the fact that you have to allow for more altitude loss to complete a 360-degree turn. One thing in particular I might mention is the fact that the rate of descent does not change appreciably from the clean configuration to landing configuration. With a free windmilling engine in a standard rate of turn of 3 degrees per second, I figure on a loss of altitude of approximately 7500 to 8000 feet for every 360-degree turn. From results of tests we have made we have found that the best glide speeds for the airplane are 210 knots clean and 170 knots dirty.

I have been committed to several deadstick landings in the *Skyray* during Douglas' intensive test program, and I have successfully landed the airplane each time using the normal hydraulic power control rather than going to manual flight control. Starvation of the hydraulic power control pressure has a gradual onset which you can feel with each successive deflection, so it won't sneak up on you. When I completed the deadstick tests on this airplane, I rapidly cycled the controls until I completely starved out the control system, which froze the control stick. All that was necessary to obtain pressure again, was a release of the stick for a second or so, at which time rapid pressure build-up occurs. A full set of cycles is then again available to the pilot.

For this reason, I repeat, I never consider going to the manual flight control system, unless it is absolutely necessary, such as would be the case with a non-windmilling engine.

The important thing to consider is a deadstick landing is first of all good planning and getting yourself all squared away for actual landing, before you start your final 360-degree turn. I like to have my gear all down and locked and be at the proper airspeed prior to entering the high key. Remember this bird has a high rate of sink so a healthy airspeed has to be maintained in order to complete your flare out. If you try and complete a flare at low airspeed, all you will succeed in doing is changing the angle of attack and driving the gear up through the wings on touchdown.

On the basis of this philosophy, I therefore recommend the following procedures. It has been proven that adequate hydraulic power control for landing is available, providing 15 percent windmilling RPM can be maintained for flare and touchdown. The airspeeds quoted are IAS and altitudes refer to terrain clearance as follows:

Glide speed, gear up	210 knots
Extend gear	10,000—30 to 40 seconds
Initial 360° point (high key)	8000—170 knots
180° point (low key)	4000—170 knots
Bank angle	25° to 30°
Flare	165 knots
Touchdown	130 knots

With a free windmilling en-

One other thing I might mention is the rather high adverse yaw characteristics of the F4D when making a turn at low airspeed using stick alone. As in the old prop jobs, stick and rudder together is a must to turn an airplane properly. Such is the case with the Skyray.

gine, the above airspeeds produce 20 to 25 percent RPM and 15 to 18 percent for flare and touchdown. With external stores aboard, increase airspeed approximately 5 knots.

For a deadstick, using "Manual" Flight Control, I use the following airspeeds and altitudes:

Glide, clean	210 knots
Ext. gear	12,000
Initial 360° point (high key)	10,000—175 knots
180° point (low key)	5000—175 knots
Bank Angle	15 - 20°
Final approach	Wings level at 1000 ft.
Flare	170 knots
Touchdown	140 knots

The steps that I go through when making a deadstick landing are as follows:

Using Hydraulic Power Control:

1. Throttle off
2. Yaw damp and auto pilot switch off

Note: To permit servo rudder to float free, as with loss of aircraft power, the servo rudder will sometimes seek a full deflection position, causing a pilot to hold manual rudder and aileron deflection against it, to maintain symmetrical flight, and this robs you of some of the hydraulic power available from windmilling RPM.

3. Crank MAC to 2:1.

Note: This is a precautionary measure in case you have to pull elevon disconnect and go on MANUAL flight control at the last minute.

4. All switches OFF except BATT.

Note: Leave Battery ON for radio and pitch trimmer.

Using Manual Flight Control:

1. Same as (1) above.
2. Same as (2) above.
3. Same as (3) above.
4. Same as (4) above.
5. Extend stick—full up.
6. Pull elevon disconnect between 200 and 300 knots.

The power plant used in the airplane is the Pratt and Whitney J-57-P8A or -P8, a twin-spool axial flow turbo-jet with afterburner, which, I might add, is one of the best jet engines I have ever flown.

There is one other thing as far as deadsticks are concerned and that is straight-ins. Straight-in approaches are very difficult as a rule and vary in type depending on your particular situation. Generally, I keep the airplane clean until I know I have the field made, and attempt to touchdown at the desired point (one-third down the runway). In the case of overshoot, making S-turns on final and using moderate slips help lose airspeed and altitude, which can be done in this airplane very satisfactorily.

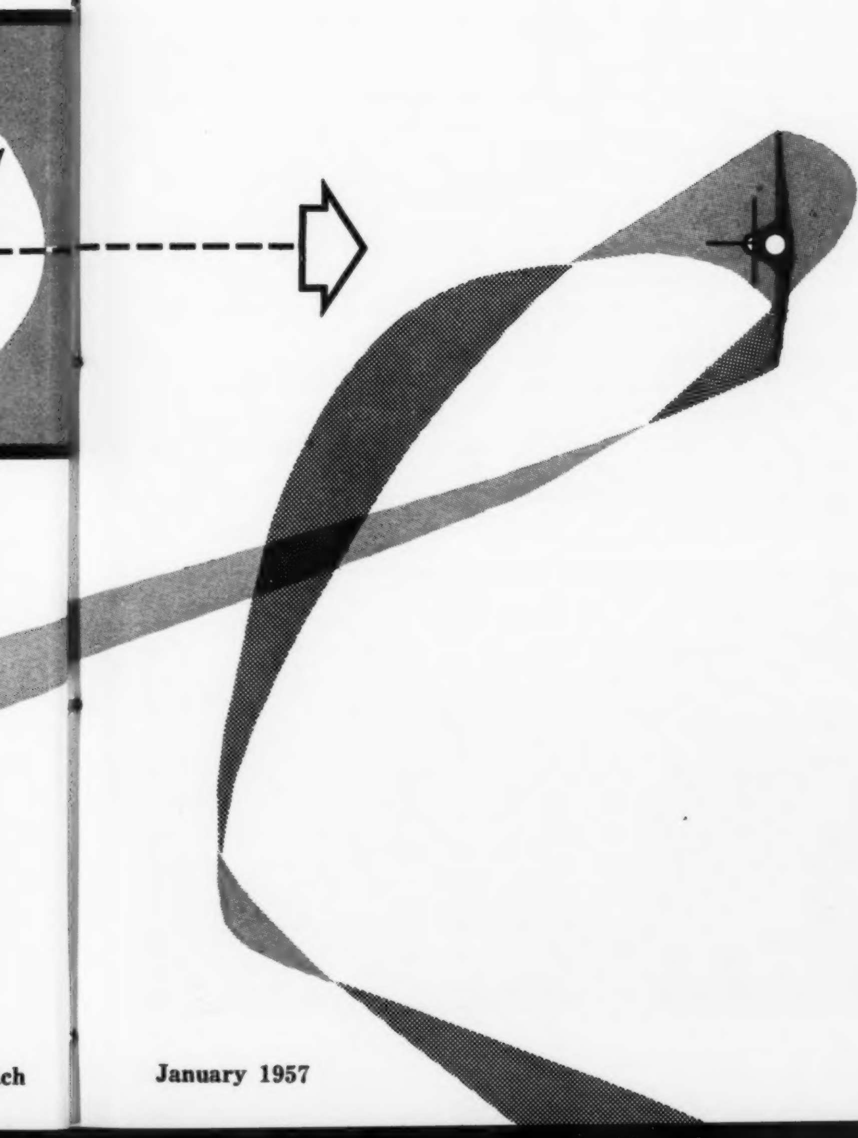
One of my pet philosophies pertaining to deadsticks is this. I always shoot for the middle of the runway, initially, and plan on losing airspeed and altitude in the final turns, because if you are hot and long, there are several ways to slow yourself down. If I'm going to go through a fence it's going to be on the far end, after landing roll where my speed is considerably slower. Once you put it on the deck you can always lock the brakes and blow the tires or even jerk the gear, if necessary. If you are short, there isn't a thing you can do but end up in a pile of tin!

I haven't covered all the details that I would have liked in this article. However, I'm sure you won't have any trouble flying the Douglas F4D, if you remember to keep your head out and use good ol' common sense. This will always get you through the rough ones. •

"Well, he's never had a cold cat shot!"

THE TANGLE WI

ITH THE *Angle*



IF you know your stall speed increases with bank angle, you're right. If you don't know *how much* it increases, watch out!—You may be dead wrong!

Ask another pilot what happens to stall speed in a steeply banked turn. Ask him seriously. You want to know. He'll think you are pretty much of a Dilbert, and his sage reply will be something like, "It goes up, naturally." More than likely, he has imparted in those three words his total knowledge of the subject.

Though all pilots know stall speeds are higher in a turn, too few realize *why* or *how much*. Merely knowing it increases seems to satisfy some pilots. But ignorance of the relationship between angle of bank and stall speed is the reason for the large number of stall/spin accidents.

Over half of the pilot-error accidents occur in the landing phase of the flight. A very high percentage of these accidents are of the "stalled, spun into the ground" variety.

Please turn page

THE TANGLE WITH THE *Angle*

Continued

So—do *you* know the *why* and *how much?* If not, the few minutes you spend here will mean more than the Rock of Gibraltar when it comes to life insurance.

Why?

First, why is stall speed higher in a banked turn?

Stall occurs when design lifting capability of the wing is exceeded. Angle of attack, speed, drag, weight and angle of bank all contribute toward reaching this design limit. Makes no difference if you're flying a Delta wing supersonic stovepipe or a P2V, they're sisters-under-the-skin.

You know that lift varies directly with speed—low speed, low lift. You also know that lift varies with the angle of attack—higher angle of attack, higher lift (up to the stalling angle).

What happens when you bend your iron bird into a steeply banked turn? To hold it, you have to haul back on the stick, and your airspeed drops off some. You also get that sit-down-harder feeling in the seat which indicates additional G-loading on the airplane from the centrifugal force generated.

Now we have something to work with that indicates stall speeds are going to be higher in this-here turn: G-force, which in other words, makes the effective weight of the airplane greater than the actual weight, and hence requires more lift; the pull on the stick which increases the angle of attack; and the drop in airspeed during the turn. They're all tied in together.

As you can see from a quick glance at the diagrams of Figure 1, the lift required in a 30-degree bank is only slightly greater than the weight. In the 60-degree bank, the lift is twice the actual weight, but equal to the effective weight. The steeper the angle of bank, the greater the lift requirement.

To get this extra lift which will overcome the G-effect of centrifugal force, we pull back on the stick and increase the angle of attack of the wing. This increased angle of attack causes a rise in induced drag (which incidentally, is always higher at slower airspeeds). Increasing the drag decreases the airspeed.

See how this package all ties together? *Low airspeeds and steep bank angles are not compatible.* In the turn, you tell the wing it must produce more lift, and it does that—up to a point. Beyond its capability to produce more, it stalls out trying.

There you have the *why* of higher stall speeds in a banked turn. Now let's discuss the *how much.*

How Much?

For the mathematicians, here's the formula:

$$V_2 = V_1\sqrt{\frac{1}{\text{cosine of angle of bank}}}$$

Where:

V_2 is the new stall speed, in turn
V_1 is the stall speed at 1 G, wings level, given weight.

But since everyone didn't get an A in math, let's put it into words and pictures.

The cosine function runs from 1.0 when the wings are

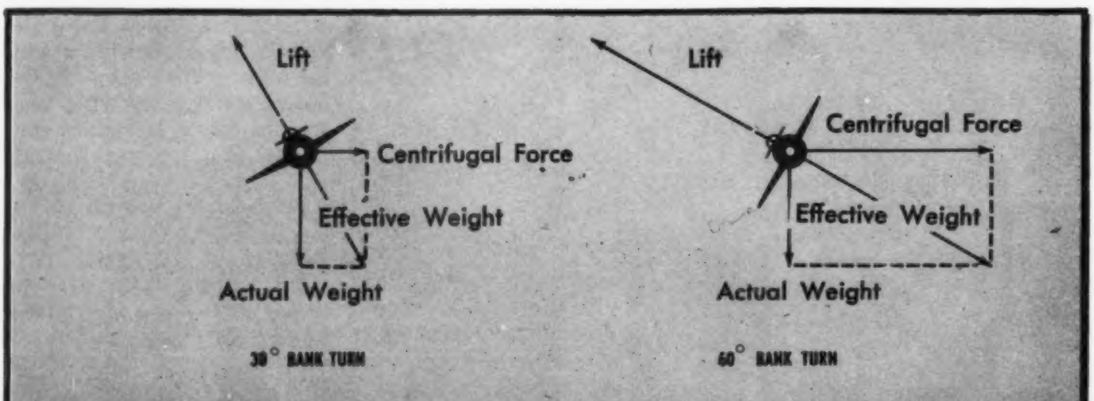


FIGURE 1 LIFT – WEIGHT FORCES

level to 0.866 in a 30° bank and 0.035 in an 88° bank (infinity in a 90° bank).

Peer at that quantity under the square root sign. The bigger the number underneath the line, the smaller the increase in stall speed. Let's solve right here the 30° and the 60° banks, using a hypothetical airplane that stalls at 100 knots, wings level. We'll shoot for ball-park answers.

First, 30° bank:

$$V_2 = 100\sqrt{\frac{1}{.866}}$$

$$= 100\sqrt{1.15}$$

$$= 100 \times 1.07$$

$V_2 = 107$ knots, new stalling speed in 30° bank turn.

Redoing it for the steeper bank where cosine of 60° = .5:

$$V_2 = 100\sqrt{\frac{1}{.5}}$$

$$= 100\sqrt{2}$$

$$= 100 \times 1.41$$

$V_2 = 141$ knots, new stalling speed in 60° bank turn. Are you convinced?

Figure 2 shows the percentage of increase in stall speed plotted against the angle of bank. Know this too, the stall speed is proportionately higher at any bank angle for heavier operating weights, but the percentage increase is the same for any weight at a given bank angle.

A simple thumb rule for angle of bank versus approximate stall speed increase—30° bank is a 10% increase; 45° bank is 20% increase; 60° bank is 40% increase; 75° bank is 100% increase.

That "hot" vertical break

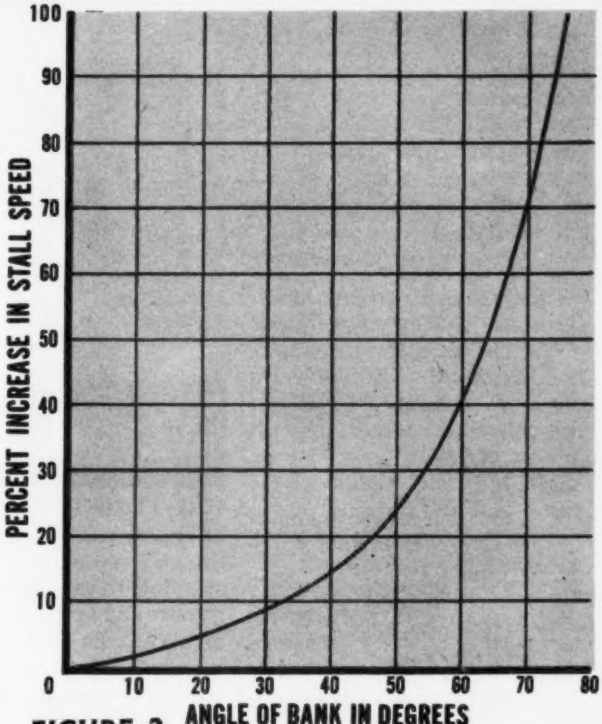


FIGURE 2

over the ship or the field will really take a lot of airspeed to keep from spinning out of the breakup. Or when you're overshooting the windline for landing, will you wrap it up tighter or take it around? Just remember that above 60° banks, your stall speed goes clear out of sight in an awful hurry. It is here that the stall/spin accident occurs.

Now what have you learned? What kind of answer can you give the next generation aviator who asks you the question we started out with: "what happens to stall speed in a steeply banked turn?

- You know that stall occurs when you exceed the design lifting capability of your wings.
- An increase in gross weight raises the basic 1–G stall speed.
- G in a turn acts as an effective weight increase.
- Stall speed rises rapidly at steep bank angles.
- In a 65-degree bank, your stalling speed is half again as high as with wings level (an amazing 150% of basic stall speed).

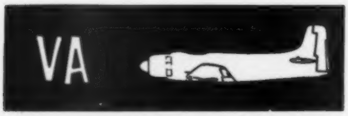
These rules are applicable to any aircraft and at any weight . . . so, gents—

In a banked turn, it pays to know all the angles!

Compiled from classroom articles written by Lcdr. Donald M. Phillips, Major John V. Hanes, Lts. Edward M. Porter and Fred J. Pester, students in the Aviation Safety Officers Course at the University of Southern California. Lcdr. Phillips is now stationed at NAMTC, Point Mugu, California; Major Hanes is at MCAS Kaneohe Bay, Ohau; Lt. Porter is in VF-124 at NAS Miramar, California, and Lt. Pester is aboard the USS LAKE CHAMPLAIN.

A DIGEST OF
SIGNIFICANT AIRCRAFT ACCIDENTS

Truth and



TOO EAGER—The pilot took off in an AD-4B, as wingman in a two-plane formation scheduled for simulated naval gunfire support spotting. When airborne, the pilot switched to his full right auxiliary fuel tank and was still drawing on it an hour and 15 minutes later when the section made a simulated gunnery run on four other aircraft.

As the run was completed, thè AD pilot noticed a fuel pressure drop and immediately switched to the main tank, changed to rich mixture and turned on the emergency fuel boost pump. The engine surged several times but would not maintain fuel pressure, and power was lost.

The pilot made various fuel and throttle manipulations in an attempt to regain power, then broadcast "Mayday" and headed toward a nearby airfield. Seeing that he could not make it and that he was headed for a populated area, he made 180-degree turn into the wind, dropped full flaps and landed wheels-up in a corn field. The pilot was uninjured; the AD received overhaul damage.

This pilot had just over 600 hours total time. The yellow sheet showed no major discrepancies since last check. The pilot's statement indicated the possibility of failure of the fuel boost pump; on the flight the day before the crash!

From his statement: "I had flown this plane the night befor the accident and had no-

Consequences

Failure to take proper action regarding a known discrepancy boomeranged.

ticed no rise in fuel pressure with the fuel boost pump on. I made my landing and retired for the evening. On the day of the accident, I carefully preflighted my aircraft. While attempting to start, I noticed that the fuel boost pump still gave no pressure rise and I had difficulty starting . . . I have no suggestion as to how this accident could have been prevented once airborne; however, I should not have taken off when I suspected the boost pump was out."

In analyzing the accident, two factors stand out. First, the G-forces in the simulated gunnery run could have initiated the loss of fuel pressure. The AD Pilot's Handbook states that fuel tank selector should be positioned on MAIN for diving. Secondly, the pilot's pride in his squadron, as well as his belief of the importance of this mission, influenced him to attempt to perform the mission as assigned even with the fuel boost pump apparently inoperative.

In its conclusions, the accident board found that the pilot erred in taking off with an apparent fuel boost pump malfunction and also erred in executing the gunnery run while drawing fuel from the auxiliary tank.

But in the endorsement by a higher command, this accident was pegged: "This pilot's performance is the antithesis of the professional attitude towards flying. It is not apparent from the AAR, or the pilot's statement, whether or not he entered the fuel boost pump discrepancy on the yellow sheet after the previous flight the night before the accident, but it is suspected from the record that he failed to do so and hence, took off the next day with a fuel pump which he knew was not functioning properly (A broken wire in the boost pump electrical circuit was found in the investigation). This is in itself a mark of very poor judgment. The consequence of this lack of professional dependability might, however, have been that some other pilot might have flown this aircraft unaware of the fact that the boost pump was inoperative."

VR

JET WASH—An R4D-8, on an instrument flight plan over England, was suddenly confronted by a British *Venom* jet in a head-on collision situation. The jet was on a VFR flight plan, although the forward visibility was reduced from ½ to 1 mile in haze. By

Truth and Consequences

Continued

quick evasive action of the R4D, the pilot avoided a collision.

Of particular interest is the damage to the R4D caused by the jet wash of the fighter.

When the *Venom* was sighted at approximately ½ mile, the R4D was pulled up sharply in a left bank. The jet passed under the starboard wing, missing the transport by approximately 18 inches. On contact with the jet wash, the fuselage skin of the R4D was buckled, the frame at the starboard emergency escape hatch was torn at the corners, internal fuselage stations and bulkheads were slightly buckled.

After the near-miss, level flight control required the use of full left rudder, plus some aileron deflection. There was also excessive vibration in the rudder and aileron controls. The plane exhibited tendencies to turn and roll to the right.

UNEXPECTED RIDE—This T-bird pilot was strapped in, about ready to taxi out for takeoff. He fastened his safety equipment and removed the seat catapult initiator safety pin and the right armrest safety pin.

Then unexpectedly the canopy wouldn't close. The pilot put his hands on the canopy sill to pull himself up and try to shake the canopy loose.

After he raised himself a short distance the seat fired him through the canopy, Some 40 feet in the air.

The ejection seat (foreground) and pilot were fired 40 feet into the air.

Fortunately he survived, but with a scraped scalp, and a broken back and arm.

Apparently as he raised up, his hip or parachute had raised the armrest.

Improper routing of the firing cable assembly made it possible for the seat to eject when the armrest was raised just three inches. However, the ejection could still have been avoided if the pilot had reinstalled the ground safety pins before raising out of the seat or if he had made a habit of not removing the pins until turning on to the duty runway — after the canopy is closed.

There have been other variations of this unpleasant performance. One happened to a mech, who was securing the canopy for an aircraft parked for the day. The pilot's chute strap apparently got caught in the canopy.—Ed.

COCKPIT FUMES—After takeoff and while climbing through 15,000 feet the pilots of a TV-2 noticed a right wing-heavy condition. A turn back to the field was commenced and the RPM cut back to 70 percent. Following that action fuel fumes were detected and fuel began to discharge from the canopy defroster ring, partially blinding the pilot. All fuel switches were turned off with no apparent effect and the engine was shut down. The fuel discharge subsided and later the fuel master shutoff valve was closed.

Between the 180- and 90-degree position of the flameout approach the gear was extended using the normal hydraulic system and shortly thereafter aileron boost was lost. Tiptanks were jettisoned in the groove with wings level and the plane passed over the end of the runway at about 140 knots.

The left main gear was locked down with the right main and nose gear extended

On an actual flameout approach the pilot failed to lower his gear by the emergency method and the gear collapsed on rollout.

but *not locked down.* The canopy was jettisoned and and speedbrakes were lowered prior to touchdown. After rolling straight ahead for about 2000 feet the right gear partially collapsed as did the nosewheel. The plane came to rest supported by the left main gear, speedbrakes and left wingtip.

It was concluded that the pilot erred in neglecting to use the emergency landing gear extension system to lower landing gear, and that he depended on the normal system hydraulic pressure available from a windmilling engine to provide aileron boost, extend landing gear and lower speedbrakes.

According to the board, any combination of the following actions would have corrected the discharge of fuel: (1) closing the defrost control valve, (2) turning off the tiptank pressurization, (3) increasing engine speed to 100 percent, (4) closing the cabin pressurization vents and dumping the cabin pressure. The action of shutting down the engine had a very definite effect but ultimately placed the pilot in an extremely hazardous position.

TSK, TSK, MR. INSTRUCTOR—A normal full-stop landing was attempted with a P2V at the completion of an instrument training flight, with the student pilot in the left seat. The 8000-foot runway was covered with patches of ice and slush, but braking action was known to be fair to good.

After touchdown, the student pilot applied reverse pitch and noted a tendency to swerve to the right. He released the propellers from REVERSE and brought the aircraft back to the center of the runway by means of rudder control.

At this time, the pilot, in the right seat, took over the throttle controls and again placed both propellers in REVERSE pitch. As he applied power, the aircraft commenced another skid to the right. More power was applied to the port reversed throttle and the skid became more pronounced. As the aircraft left the runway on the right-hand side, full reverse power was added to the port engine.

No attempt was made by the pilot to use rudder or brakes to correct the skid. The student pilot, in the left seat attempted nosewheel steering, but found it ineffective.

Off the runway, the plane ran through a drainage ditch that sheared the nosewheel and allowed the propellers to contact the ground.

The accident board was unable to determine if the port propeller reversing mechanism had functioned, due to damage to the propeller when contacting the ground. However, the board considered as a probable factor that the port propeller had not reversed and that application of power to the engine caused the skid, and aggravated it as power was increased.

On an 8000-foot runway, with even fair braking action, it would seem that the aircraft could have been stopped without the use of reverse pitch.

Also, there is no indication that a propeller reversing check while taxiing out at the beginning of the hop was performed. This is standard procedure for most P2V squadrons and enables the pilot to determine faulty reversing mechanisms before flight.

Another standard procedure in the P2V is to determine positively that reverse prop action is available before applying any appreciable amount of power during landing rollout.

It is possible to use the reverse feature of only one engine, if the aircraft is kept straight down the runway with opposite rudder. Normally, very little nosewheel steering is necessary *if* full opposite rudder is applied. ●

ANYMOUSE and

In collaboration with an editing Flight Surgeon, Anymouse brings you some hairy and informative incidents involving

OXYGEN TROUBLE

CASE I

"I was leading a flight of four F9Fs heading up to 35,000. We leveled off at 30,000 for a short period and I felt a slight groggy sensation. I switched to 100 percent but immediately after switching I passed out. I noticed I had 1500 pounds of oxygen and the blinker was operating satisfactorily.

"I dimly remembered pilots of the flight calling me but at the time nothing registered. When I came to I was at 10,000, climbing in a very steep nose-up attitude. My position report to the base was 30 miles off and a TV-2 was dispatched to escort me home.

"My mask was found to have bad inhalation valves and exhalation valves. However, this discrepancy only showed up in about one out of four checks. I believe this could have been prevented had I checked my mask more carefully and had it cleaned regularly.

"I noticed I had no real warning of hypoxia at any time. The correct procedure would have been to switch to pressure oxygen immediately. Also, I believe it would help to call a pilot by his name rather than by the flight call or aircraft number."

CASE II

On a tactics hop in a TV-2, Anymouse was No. 2 man in a flight of three. At 30,000 feet a series of called turns began. On the second turn Anymouse became disoriented and broke formation.

"I felt no dizziness," he said, "had no narrowing of vision, nor felt any of the other symptoms of hypoxia. I faintly heard the instructor telling me to go to 100 percent and switch to 'safety.' Soon I realized I was out of position and had no idea how I got there.

"The oxygen equipment checked out okay on deck but on comparing pressures with other members of the flight I found I had 100 pounds more oxygen pressure than anyone else. This led me to believe that the regulator malfunctioned and the only indication was the failure of the oxygen pressure gage to drop off.

"I recommend a frequent check of the pressure gage to be sure you are getting oxygen."

CASE III

During a cross-country in an FJ-2, Anymouse was affected by hypoxia and regained his senses at 19,000 feet. His wingman rejoined him and reported a low fuel state, suggesting a descent and landing at Pittsburgh.

Anymouse replied that he felt fine and for the wingman to follow him. They were going on to Columbus. "At this time," Anymouse said,

his hairy tales

Anymouse reports are submitted by Naval and Marine Corps aviation personnel who have had hairy or unsafe flight experiences. As the name indicates these reports need not be signed. The purpose of Anymouse Reports is to help prevent or overcome dangerous situations. Forms for writing Anymouse Reports are available in ready rooms and line shacks. All reports are considered for appropriate action. Send reports to the Naval Aviation Safety Center, NAS, Norfolk 11, Va.

"I noticed the scattered layer of clouds below me was now an overcast. I thought it looked pretty down there, so I decided to go down to 13,000 where I could get a better look at the clouds. The thought that we were low on fuel never occurred to me.

"My wingman kept calling me every couple of minutes giving his fuel state and telling me the weather looked bad. I was becoming annoyed at his constant transmissions and told him to 'Be quiet and follow me.'

"After flying at 13,000 feet for a few minutes, I seemed to snap to my senses and realized for the first time that we had trouble. We had about 15 minutes of fuel and I figured we were about 15 minutes from the field.

"I spotted a small hole and luckily got VFR under a 1700-foot ceiling. My wingman spotted the field a full minute before I did.

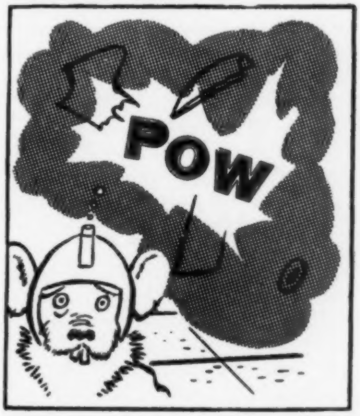
"The two planes took a total of 1655 gallons. Combined capacity is 1670 gallons."

CASE IV

Preflighting his F9F-8 before departing from a strange field, Anymouse found his emergency landing gear air bottle several hundred pounds low. After an hour and a half of fruitless effort to bring the bottle up to pressure, the line chief suggested using the oxygen cart to fill the bottle to capacity, since the cart had sufficient high pressure.

"Needless to say," gasped Anymouse, "I was completely amazed at this suggestion, especially from a supposedly informed person.

"This little incident convinced me that constant vigilance is needed when maintenance work is being performed at a strange field. It is not definitely known what the results would have been if this oxygen filling took place, but it could have been explosive!"



CASE V

Two Anymouses were in a TV-2 and upon passing through 20,000 feet Anymouse No. 2 in the rear seat complained of being a little tired. He passed it off as a result of late social activities the night before and Anymouse No. 1, up front, thought no more of his complaint.

After topping some buildups at 38,000, Anymouse No. 1 leveled off and passed control to Anymouse No. 2. "A little while later," No. 1 stated, "while tuning in a new range station I sensed we were in a bank. I looked up and, sure enough, we were in a 60-degree roll.

"Glancing into the rear-view mirror, I saw with horror that Anymouse No. 2 was pale white. I told him to pull his bailout bottle but it was too late. His face had turned a placid grey and he was unconscious."

Anymouse No. 1 grabbed the controls and made an emergency descent, turning to get off the airways. By this time the TV-2 was over a solid overcast and Anymouse No. 1 was not paying too much attention to flying as he kept looking into the mirror and telling Anymouse No. 2 to pull his bailout bottle. At about 20,000 feet the aircraft began to shudder violently and upon checking the instruments Anymouse No. 1 found himself in an unusual attitude with severe thunderstorm turbulence. He made an unusual attitude recovery and finally broke out at 9000 feet where Anymouse No. 2 woke up.

"After landing," Anymouse No. 1 reported, "we found the oxygen hose clamp on the seat missing, causing diluted oxygen at all altitudes. I learned several things from this little fiasco: (a) even though something happens to your passenger, pay attention to your flight instruments *first and foremost*, (b) when commencing an emergency descent advise the nearest radio facility of your actions right away, (c) do not disregard complaints of tiredness, dizziness . . . while at altitude."

CASE VI

Anymouse was number 2 man in a flight of three AD-6s on a routine tactics hop. It was a clear, crisp autumn day and high overhead, contrails swirled as the jets practiced gunnery runs.

As Anymouse remarked, "With the plucky fighting spirit common to naval aviators it was decided that we three stalwarts would climb

Continued next page

ANYMOUSE
(Continued)

to maximum altitude to see first-hand how the other half lives.

"All the pilots had over 700 hours in model and had flown previously at altitudes up to 20,000 feet on high-altitude dive-bombing hops. Low pressure chamber training and oxygen checkout in the squadron had been thorough, though not recent. By all odds, this seemed to be a safe and interesting diversion for our normally low altitude birdmen, so the slow and tortuous climb was started."

More than an hour later Anymouse and his friends found themselves nearing their operational altitude limit. A cheery chatter was filling the squadron common as notes and impressions were passed on their aircraft performance. Frequent oxygen checks were held. Number 3 was having difficulty with his microphone, but managed to be understood.

The climb was continued to over 32,000 feet but it was decided to discontinue further efforts as, by now, the jets had long since gone home. Anymouse was to all indications normal at the time of this decision, but does not remember hearing the flight leader's call for a gentle left turn given 15 to 20 seconds later. He passed through the leader's slipstream and began a gentle diving turn to the left.

Number 3 chortled gleefully at Anymouse's lack of aeronautical acumen. As Anymouse pulled up into a wild uncontrolled wingover and began a graveyard spiral toward the earth, more than six miles below, the merriment changed to horror as the other members of the flight realized that hypoxia had struck.

They tried to keep him in sight with a "brakes extended glide" at near red-line speed. Frantic calls to Anymouse to "go on 100 percent and turn on your safety pressure!" went unanswered. With Anymouse well in the lead the three ADs continued diving toward the ground. Finally, losing sight of Anymouse, the flight leader made one final plea with him to go on 100 percent.

He was answered by a confused, groggy voice. Anymouse stated he would comply and that he was at 17,000 feet. Regaining sight of him the number 3 man joined up and found the altitude actually 7000 feet. Anymouse's divebrakes were extended and he was at a dangerously low airspeed.

The flight rejoined, checked Anymouse's aircraft and headed home for an uneventful landing.

"I dimly recall being in the steep spiral," said Anymouse, "and opening the divebrakes at a very high indicated airspeed, then blackness. Finally, I recall hearing the hollow voices of angels screaming at me to go on 100 percent oxygen. I came to in an inverted climb, fought for control of myself and my plane and was soon in business again."

Three badly shaken aviators paid a visit to the flight surgeon where the diagnosis confirmed hypoxia suspicions. Anymouse was suffering from a painful earache and feverish flushed feeling but was otherwise okay.

A check of the aircraft revealed minor damage to the horizontal stabilizer and an 8-G reading on the accelerometer. No obvious reason was found for the hypoxia. The oxygen equipment as well as the aircraft installation checked O.K. on the ground.

After studiously searching out high altitude facts of flight, Anymouse and his companions concluded that the use of safety pressure at the first sign of inboard mask leakage be stressed and that SOP be followed in switching to 100 percent oxygen manually at 28,000 feet.

CASE VII

An instructor and student in a T-28-B believed they had checked their oxygen systems thoroughly before takeoff. During flight the instructor began yawning, but attributed it to sleepiness, until he tried to instruct the student to change course. He was unable to speak.

Turning to 100 percent oxygen did not help and his vision blurred. Emergency oxygen afforded no relief until he disconnected his mask and breathed directly from the tube. He was then able to set the plane down safely, although he was still groggy and forgot to use flaps.

A check of the relatively new mask showed dirt and improperly working inlet valves. Pilots and crewmen are warned that dirty oxygen masks can be fatal.

THAT LOWDOWN FEELING

"VF squadron . . . day fighter mission . . . LTJG with 300 hours in *Cougars*. Second strafing hop of training cycle. Target . . . vehicle in desert.

"Made six runs approximately 30 degrees using manual tail. After sixth run decided to use Flying Tail for next runs.

"Normal run . . . normal fire. Started slightly late pull out . . . because of previous heavy stick pressures, pulled back hard on stick. Found head in lap . . . very surprised . . . released stick . . . head against canopy. Aircraft still heading for desert. Pulled back again . . . still way too hard. Released again . . . head thrown against canopy.

"Realized difficulty. Meanwhile some type of oscillation had been set up which was very difficult to stop. Finally leveled at less than 200 feet. Returned to base . . . bruised and badly shaken.

"Habit pattern got me into a situation which I was not alert enough to recognize until too late. Moral! Don't change procedures in the middle of the exercise!"

WHOOSH

"On a simulated instrument hop in an F9F-8, I climbed out with my chase plane to 20,000 feet on the gages and entered Amber One northbound. I called for a channel change and the chase plane rogered.

"While dialing in and still on the gages, I noted a flash out of the corner of my eye and went contact in time to see the second section of a flight of four jets closing level at about 950 knots.

"I had time to roll 90 degrees and push through between the 100 feet that separated them. I completed dialing in the new channel and found that the chase pilot had missed them too.

"I recommend (1) flying inconvenient altitudes not set up on the REST computer, (2) flying to right of airways centerline, (3) going contact while selecting a new channel and remaining so until after a radio check (4) presetting briefed channels to eliminate confusion and delay."

For more on altitude selection as a means of preventing mid-airs, see Lt. Markovits' letter, page 3.—Ed.

MENTAL NOTE

"On a night fam hop I was ready to take the duty runway in an F2H-3. It was dark but clear. A full power check was made and brakes released. About 100 knots I eased the nose up. At 125 knots the plane was reluctantly airborne. Gear was immediately raised but it felt like one was down and an out of balance wheel was rotating. The whole aircraft was vibrating. It felt like the speedbrakes were out . . . *they were!*

"It happened simply enough. A difficult but careful preflight of the plane was made with the aid of a red-lensed flashlight. (Had to remain dark-adapted). During the cockpit check the speedbrake switch was actuated, and I looked out at the wings to check both brakes for the extended position.

"The brakes are of the spoiler type and with the wings folded, as they were that night, the brakes will not extend due to switches in the wingfold mechanisms. So making a mental note to check the action after the wings were spread, I continued my cockpit check.

"I taxied out, spread my wings and the lineman checked the winglock pins but did not notice the speedbrakes in the extended position. I didn't either!"

FORCE FEEDING

All Air Force bases will provide some form of food 24 hours a day and you can usually get it in flight gear. I fly a lot of cross-country in the U.S., and at first I was ashamed of the bankers'-hours Navy. Now I am disgusted and try to avoid landing at Navy installations. Snack bars close for inventory, cleaning, holidays, non-holidays and any other excuse.

Recently, I left Providence at 1600. Landing at NAS "X" three hours later, I was told candy bars in machines were the only available food. I took off at 2030 and landed at NAS "Y" at 2430. No food for 12 hours and almost 8 hours of flying.

I'll bet aviation medicine will agree I was prime for accident due to fatigue and lack of food.

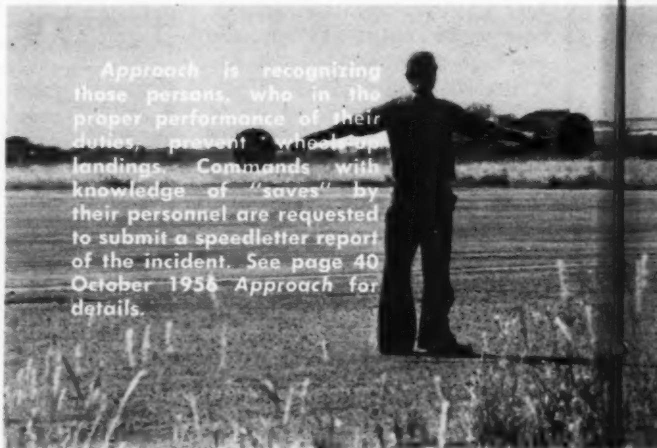
Incidently, I had left NAS "Y" at 0600 the day before. No adequate breakfast was available at 0430. I refueled at NAS "X" at 1030. The snack bar at operations was closed for cleaning and it was necessary to break out uniforms to go to the Navy Exchange.

By comparison, I landed at Craig AFB at 2300 one night. Airdrome Officer (a wonderful idea) provided wheels in flight gear to mess hall with apologies that the snack bar was closed. Fine food was provided me by the night duty messcook.

Our operations officers sit behind LSD (large steel desks) and look important. USAF airdrome officer has a primary duty to meet transient aircraft and get them service as needed to complete an assigned mission. Let's either get in the flying business as a 24-hour a day operation or go back to boats.

For this month's Headmouse report please see "Sir Launchalot," page 26.—Ed.

WHEELS-UP SAVES



Major P. G. Pickett; 1st LT J. B. Lavelle

MARTC, NAS Columbus, November 1956

The pilot of an F9F was completing a practice ASR approach to a final landing when this incident occurred. The pilot stated that under the supervision of approach control, he performed the landing cockpit check and was cleared to land. He lowered his flaps and gear handle, but, as later events proved, he did not place the landing gear actuating lever in the *full down* position, resulting in a wheels-up condition. He had his UHF received in the T/R position and tuned to Approach Control frequency.

The control tower failed to notify **Major Pickett**, the runway duty officer, that the aircraft was making an ASR approach. When the F9F was approximately one mile on final, the runway watch officer, **LT Lavelle**, signaled for the pilot to take a waveoff, using Very pistol flares and LSO paddles. **Major Pickett** meanwhile was ordering the waveoff on both tower and guard frequency, but because of the aircraft's UHF setting, was not being received.

The pilot was about 50 feet above the runway, ready to land when he observed **LT Lavelle's** frantic waveoff signals. He added power and made a successful go-around.

Corporal C. A. Counts

MCAS Miami, Date: (not reported)

Corporal Counts, aboard a truck which was pulling the wheel watch trailer toward the duty runway, heard an aircraft approach, looked up and observed an AD on final with gear up. **Counts** jumped from the cab of the truck, simultaneously loaded the flare pistol and fired a flare in front of the approaching aircraft. The AD waved off from an altitude of approximately 10 feet.

LT H. D. Crowley; Gray, R. J., AO3

NARF Spokane, 26 September 1956

At the conclusion of a practice GCA pass, two aircraft were cleared for break-up and landing. The first plane landed long but uneventfully. The second plane, which had had the wheels down for the GCA approach, was observed by **Gray**, the runway signalman, on final with the wheels up. **Gray** fired a red Very star and signaled with his paddles. **LT Crowley**, who had been observing the first plane's rollout, then called for a waveoff utilizing radio communications.

LT H. L. Gulick; Nelson, C. E., PHGAN

NAS South Weymouth, 3 September 1956

The pilot of an F9F-6 making a wheels-up approach was given a waveoff by **LT Gulick** using the portable radio equipment provided at the end of the runway. **LT Gulick** was the Runway Control Watch Officer and the Runway Wheels Watch was **Nelson**.

Dotson, A (n), Jr., AN

VU-7, 25 September 1956

While on duty as runway wheel watch at NAAS Brown Field, **Dotson** prevented a wheels-up landing of an AD by firing flares that caused the pilot to execute a waveoff. This occurred just 30 minutes before midnight.

Clark, P. R., AN; Downhour, R. E., AC3

NAAS Cabaniss Field, 25 October 1956

The pilot of a T-28B was making a wheels-up final approach when a flare, fired by **Clark**, the runway wheel watch, and a combination radio warning and red Aldis light from **Downhour** in the control tower, alerted him of his failure to complete the landing checklist. The pilot took a waveoff, saved by the alertness of the two men on duty.

NEXT MONTH—Watch for a special Approach feature on [illegible] and equipment recommendations for their prevention. Get [illegible]

Becker, D. E., AM3

VA 116, 1 June 1956

On duty as runway signalman, Becker observed a wheels-up approach of an F9F-8. Becker fired his Verys pistol in front of the pilot and prevented a wheels-up landing.

Ahearn, L. P., AN; Shuman, J. H., Jr., Civilian Crash Crew Driver

NAS Atlantic City, 29 October 1956

The pilot of an AD was making a wheels-up approach to the runway where **Ahearn** and **Shuman** were on duty at the wheels watch position. By their alert actions of calling "No Gear" over the radio and firing flares, a wheels-up landing was avoided. This was the second "save" for **Ahearn**, having been credited with a similar event 28 February 1956.

Russell, J. E., ACCA

NAS Willow Grove, 10 August 1956

The pilot of an F9F-6 reported "turning base, gear down and locked" to **Russell** in the control tower. **Russell** observed that the gear was *not* down and immediately informed the pilot of his habitual and erroneous report. The pilot thereupon lowered the gear and landed successfully. No action was required of the runway control officer due to the alertness of the control tower operator.

LT G. R. Chase; LT C. E. Gillette

VF-713, Date: (not reported)

During the annual active duty cruise of the squadron, two F9F-6 wheels-up landings were prevented by the Runway Control Watch Officers on duty. In the first incident, **LT Chase** issued UHF radio instructions to "Cougar on final, go around—your wheels are up," and instructed the runway signalman to fire flares. The second case was almost identical except that the Runway Control Officer was **LT Gillette.**

Shipman, L. E., AO3

NAS Miramar, 14 August 1956

The pilot of an FJ-3 had executed two simulated flameout approaches straight into the runway and climbed out of the pattern to try one more in a no-flap condition. He started his approach about five miles out, calling the tower for another simulated flameout to touchdown. He was reminded to check his gear and call two miles out. **Shipman**, Runway Wheel Watch, saw the aircraft in the distance and noted the unusually long approach, similar to a GCA pass. The pilot called the tower again, this time stating that his gear was "Down-and-locked". At a half-mile from touchdown, **Shipman** lobbed two flares well ahead of the FJ, causing the pilot to reconsider his statement and take a waveoff—his gear was up!

LTJG R. L. Mann; Jibby, W. K., AN

VF-872, 13 October 1956

During night flying at NAS Oakland, an F2H was approaching for a landing. **LTJG Mann**, the runway control officer, observed the aircraft from the 180 to the 45-degree position, at which point he was of the opinion that he saw the approach light of the F2H, indicating that the landing gear was down. As the aircraft passed over **Jibby**, in a wheel watch position 400 feet downwind of the landing end of the runway, **Jibby** illuminated the underside of the plane with an Aldis lamp. The landing gear was up! Very pistol flares, remotely located 1000 feet down the runway, were fired in front of the aircraft and the pilot was able to safely effect a waveoff.

CLASSICS DEPT.

Sir Launchalot

Scene: A blacksmith shop outside the castle walls of Camelot. Inside the smoky hut there is a busy clanging of the smithy's hammer as he forges a new Mark IV breastplate from a glowing mass of metal. Enter Sir Launchalot, obviously angry, carrying a battered helmet by a broken chinstrap; the visor dangles by one rivet.

Launchalot: **Ho! You scurvy knave of a tinbender! Where's my new helmet you promised me last St. Swithin's Day, hah?**

Armorer: *(Soothingly)* **Lordluv yer gryce, and I've just finished the task.** *(He hurls a billet of wood at his apprentice, who scuttles to a corner to fetch a gleaming new helmet.)*

Armorer: **There it be, melud, the very latest in protection for thy pate. And flay me if it be'nt a true jewel of the armorer's art!**

Launchalot: *(Flinging down old helmet)* **And about time, I vow. Lookit that cursed old magpie cage you foisted off on me before. The visor won't stay up; the corners chafe my noggin sorely, and I must perforce gallop with one hand atop the foul bucket lest it jostle off. Here, let's view this latest instrument of torture you've created to plague me.** *(Attempts to place helmet over head. Chin strap catches him in choking grip as he struggles unsuccessfully with the side clasp.)*

Launchalot: **S'death, thou fiend! What manner of fastening is this? Methinks you've been experimenting again, else you forgot a means for getting my head into this contraption.**

Armorer: *(Demonstrating simple operation of clasp)* **Yr'pardon, gentle knight, but this is a new clasp of mine own designing, which permits you to snap the chinstrap tight—so; or to remove the helmet instantly with the touch of one hand, leaving the sword hand free for action. By my troth, your worship, there's none finer in all Christendom, I wot!**

Launchalot: *(dubiously)* **Hummphh! That's what you said about the quick-disconnect seat plate you installed in my last suit of armor, you rogue, and *that* fiendish gadget did forever flap and make mincemeat of my backside ere you retrofited the big hinges on't. Certes but this new gimmick be of better quality, else I'll have you flogged and take my business to shrewder artisans. One**

heareth that Emir, the Saracen ironmonger of Prince Ahfores doth boast of a marvelous helmet of surpassing beauty and lightness.

Armorer: *(with ill-concealed contempt)*: Emir? That fakir's apprentice? Marry, but his fopish crests are fit only for milkmaids sunbonnets. Just one tap of a good blade will shatter his be-feathered eggshell!

Launchalot: *(voice muffled behind the visor)* Well-ll, mayhap this will prove a better headpiece—though I fear my poor head will rattle sorely, and it seemeth passing hot and withall heavier than the old one. I am at a loss to understand why you mangy metal manglers are unable to make a few simple additions we knights request, such as double crest-plates and reinforced neck covers, without making the contraption a hundredweight heavier. If you equipment folks' heads weren't as thick as your anvils you'd fashion some proper gear for us!

Apprentice giggles at this, then pales as his master's eye squints at him. (Exit Knight)

(Curtain, as armorer, lip frothing, goes berserk and is last seen chasing apprentice with battle axe.)

Continued next page

Headmouse presents.......

Sir Launchalot

Continued

WHILE the foregoing drama is not necessarily an accurate record of what might have transpired in King Arthur's day, it's entirely possible that even then there were certain vexing details of personal equipment which made life more difficult for all concerned.

With which historical footnote, Headmouse, *Approach's* roving reporter girds his armor to present, as promised, the first of a series of "customer reports" on various items of personal and survival equipment. Armed with numerous "how come?" letters from you readers (Approach, Oct. '55) Headmouse sought out BuAer Safety, Survival and Rescue Section (AE-52) for answers regarding the first item of equipment—helmets.

Hardhat History

First, some background information on helmets is in order, and the picture goes something like this: There was an H-1 helmet, which was a one-piece, outer shell design. It resembled a modified football headgear with earphones, and its shortcomings quickly indicated further improvement to be necessary. A scientifically designed H-2 one-piece helmet followed, but its development was discontinued when the two-piece helmet-plus-liner concept appeared to be a more promising answer.

This first two-piece helmet, the H-3, featured a "breakaway" shell, with a leather shear strap (later modified with a metal ball-hook) designed to permit the outer shell to carry away under high windblast forces. Quite a number of these were introduced to the fleet, and were later modified with fore and aft stabilizing straps connecting liner and shell, and solid, non-shear chinstrap. This stabilizing strap arrangement came about when thinking again turned to keeping the helmet attached to the liner, and this modification was permanently incorporated in the familiar H-4, which became the standard anti-buffet helmet. Until the recent appearance of the APH-5, the fleet was equipped with a sort of Duke's mixture of H-4s and H-3s having H-4 liners.

Meanwhile, helmet development continued with the MSA-N2, an immediate predecessor of the APH-5, being manufactured in very limited quantity. Another contract initiated work on an individually fitted helmet, designated the BBC-X1. A further development is the BBC-X2 which is a joint effort of the Navy and Air Force. We'll speak more of this one later.

Complaint Department

For a comprehensive picture of the APH-5, Headmouse was taken to the Equipment Section's "chamber of horrors" of experimental equipment, where he fired away with the many questions and complaints received concerning this latest standard helmet. (Headmouse had scrounged the Safety Center's one APH-5 from the Aero-Med Department, and logged enough time in it to speak with some familiarity about it.)

First, the APH-5 is being purchased in quantity, and at the time of writing there have been some 5000 helmets manufactured (2500 under first contract, 2500 under second contract for 7500) and delivered at a cost of about $100 per copy.

The APH-5 was designed without a visor, and the incorporation of a visor required a cover plate in order that the helmet shell itself would not be weakened by the visor guide slot. (Headmouse poked at the

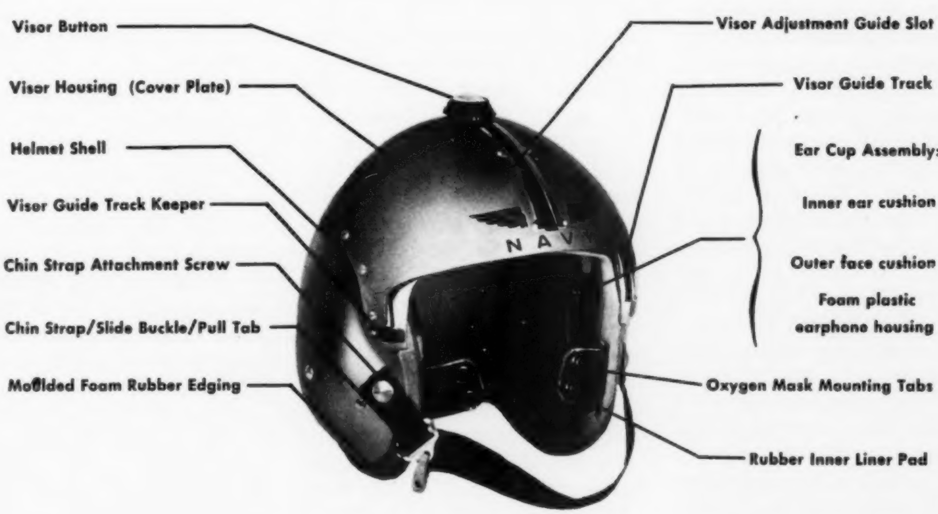
old slotted model and agreed that it was for the birds—hardheaded woodpeckers.) The final version was field tested for nearly a year by squadron pilots, during which time some 50 helmets had an average of 300 flight hours logged. From the comments

Protection vs. Comfort

The big factor in helmets, the protective quality, has been accomplished in the APH-5 with an improved shell (ridges were removed to prevent localizing of impact forces) and by an inner layer of polystyrene plastic

One thing to be remembered, Headmouse decided, is that the fit becomes more acceptable when the wearer realizes that *stability* is critically important to his protection, i.e. a snug fit, just short of uncomfortable tightness gives the optimum in both safety and comfort.

APH-5 Helmet



and suggestions thus obtained, several modifications were made and the helmet was put into production.

The APH-5 comes in two shell sizes, large and medium, which quickly proved somewhat inadequate for broad span heads. This deficiency was overcome by providing a thinner plastic earphone housing for us lop-eared types and by furnishing extension shim fittings which close-cropped pilots may insert as required.

energy absorption material which appears excellent. Six vari-sized sponge rubber pads are furnished with each helmet to provide individual fitting. The trick seems to be to try various combinations in order to get the best fit. (Headmouse thought he had a good initial fit, but after several hours, one or two pressure spots became somewhat uncomfortable. These were eliminated with insertion of a smaller pad in the appropriate area.)

Hot Subject

On the problem of heat, the equipment section people don't deny that the close fitting sponge rubber lining may produce more heat than the old cross-strap webbing of the H-3, -4. But they remind you that the new helmet offers contact all over your head, which condition is somewhat new to those of us who dislike wearing a Borsalino even in the winter. Headmouse recalled his initial introduction to the H-3 brain-

Sir Launchalot

Continued

bucket, which produced a pretty negative reaction, for about a month, after which it became just another item of gear.

There *are* consistent reports, however, that the sponge rubber collects perspiration in an unsatisfactory manner.

Regarding this problem, BuAer advises that heat tests of the helmet are being made and that there is also some promise of relief seen in improved, leather-covered liner pads which are being considered.

Visor Viewpoint

Now about the visor—most of you seem to regard it as quite an improvement, at least from the vision viewpoint, and the visor fit to the oxygen mask is pretty fair. (A modification being incorporated in production models provides a different angle of the oxygen fastener tabs on the helmet, which will make the mask hang more comfortably.)

A number of complaints on the visor button have been received — the binding problem was solved in later models by the use of a template for aligning the track before riveting, and by burnishing the visor track to reduce friction. Helmets produced under the second contract appear to be free of this binding. Headmouse was concerned over the possibility of the face curtain hitting the visor coverplate shoulder — seems as if the coverplate might be more smoothly faired into the helmet to prevent possible curtain hanging.

The problem of the curtain dragging over the visor button seems of lesser importance. (Headmouse hopes to have time enough to get the visor down before yanking the curtain). The scraping of the button on the roundheaded rivets, which you may have experienced, is being corrected with substitution of flush eyelets. A reported tendency of the visor to "walk" back under high wind forces has been corrected with an additional spring in the button track, and the equally irritating tendency of the visor to slip out of the guide track has been corrected with the addition of an eye shield guide leaf spring on either side. Backfit kits are being shipped to holders of the earlier models.

Choose Your Filter

Headmouse found that the plastic visor, or filter lens, comes in several shades of "neutral gray" with marks on the inside of the lens to indicate the relative "darkness" or degree of visible light transmission afforded. (For example, in normal Navy sunglasses, about 85 percent of the visible light is blocked out.) Here's how you can choose your particular "shade":

In the first APH-5 contract, the marking of the lenses goes:

"D"—10-20% of visible light transmittance.

"XS"—Below 10% of visible light transmittance.

In the second production contract the following marking is effective:

"D"—10-20% visible light transmission.

"XD1"—8-10% (medium dark).

"XXD"—6-8% (dark).

"XXY"—Below 6% (very dark).

These varying shades were made available for obvious reasons of mission and specific visual conditions, plus such factors as the demand by light pigmented (blond) pilots for darker lenses. The visor, which has held up in sled runs of over 600 mph, is regarded by a major optical authority as the best job of eye shield design they had seen.

Plug Troubles

In the first 1500 helmets manufactured, the plastic female communications plug on the side of the helmet obviously is poorly placed and subject to frequent breakage. This is remedied in later models with a lead-in which extends from beneath the edge of the helmet. For those who have the earlier types, BuAer hopes to have spare parts soon.

For those of you who have heard of the "Christmas tree" oxygen clip, BuAer tells Head-

mouse that a number of the Hardman bayonet type adjustable fittings have been purchased for evaluation, and right now they look pretty good. This mask fastener may be quickly inserted in a slot receptacle on either side of the helmet for a comfortable fit and a quick disconnection. Headmouse liked this feature very much.

APH-5 vs. P-4

Because of the continuing interest in the respective qualities of various services' headgear, Headmouse chose to compare the Air Force standard P-4 helmet with the APH-5. Point for point, for weakness, the APH-5 seems to be considerably superior to the P-4. First, on the basis of sheer protection, the APH-5 offers about the same superiority over the P-4 as over the old H-3/4 jobs. While the P-4 has a beautifully finished outer shell, it has fewer cross straps than the H-4 in its suspension webbing, and has no energy absorption material other than a wafer thin disc of sponge rubber.

Comfortwise, the P-4 has the advantage of limited head contact and provides air circulation space. Even so, with respect to weight, Headmouse weighed a *small* P-4, with earphones, and found it to be one ounce *heavier* than the large size APH-5 with earphones installed.

So much for that portion of the discussion, which can obviously become one of personal opinion versus individual likes and dislikes. Headmouse adds only that the helmet people at BuAer are very definite in pointing out that the APH-5, like any such item, is but another step in improved protection—with no one step being offered as the final answer.

For the Future

Regarding that next step, Headmouse was interested to learn that the most promising helmet under development, the BBC-X2, will incorporate a new helmet shape plus a novel means of providing individually molded fits. Using an epoxy resin for the energy absorption material, non-technical personnel at the squadron level will be able to make individual head molds which will be placed in the new shell, covered with a thin, comfort layer of sponge rubber with an inner lining of chamois. The visor will retract between the outer shell and the energy absorption layer.

This development, you're reminded, does not conflict with the continuing work on pressure suit helmets, but is intended eventually to replace the APH-5 in the still well-populated lower levels of air operations.

That's the picture on the helmet situation—Headmouse figures the APH-5 has drawbacks and deficiencies, but that the overall result is a considerable improvement over previous headgear. The one remaining question, that of "How and when can *I* get one?" is pretty much a matter of expeditious movement through the supply pipeline, and that phase of the problem is outside the function of BuAer.

Footnotes: Should you have trouble with the chinstrap screws becoming loose and backing out, try a dab of rubber cement to make them seat firmly. We heard that some folks were occasionally pulling off their helmets at altitude because of the heat—we figure that could be pretty dangerous. Headmouse recommended that more adequate instructions for the fitting, care and maintenance of the APH-5 be provided with each helmet issued.

On queries concerning use of boom mikes with the APH-5, BuAer says that it is not presently contemplating the provision of boom mike attachments for the helmet, and indicated that those who require them may adapt the present boom mike attachment to the new helmet.

One final item: In case you may have been hesitant over expressing your personal gear problems, helmets and otherwise, BuAer invites the constructive criticism of its customers—address Chief, Bureau of Aeronautics, (AE-52), Washington, D. C.

Ed Note: (Watch for another "customer report" of pilots' personal equipment appearing soon).

When you gotta go

OKAY, so your airborne rocking chair has a firecracker Go-Go-Go attachment, and so you've got an OMIAS card in your billfold. So then what? Well, let's talk about somethin' that you, sir, prefer to feel might happen to the other guy . . . the old business of having to bail out or eject from your wing-wagon.

First of all, this is no invitation for you to rush out and apply for membership in the exclusive Caterpillar Club. Just want to give you some straight - from - the - shoulder dope that may help you through the initiation if you're "invited" to become a club member.

Let's start out with one of the grossest understatements of the year:

When emergencies occur at low altitudes, convert all available airspeed into altitude in order to insure time for a safe ejection, should it become necessary to eject! (Same thing is true for a nice comfortable bailout, but we'll slant this tete-a-tete toward the mechanized methods.)

This brings up the question: what is a safe ejection altitude? Good question! The British Martin-Baker seat has a ground level ejection capability, and BuAer has let a contract for 100 of them to be installed in 50 F9F-8Ts. Ground level capability is not as easily accomplished as you may think. Remember, this same equipment which must operate at split-second-speed from runway heights must also be usable at high speeds and high altitudes where a rapid parachute opening would subject the pilot to extreme forces and rip the chute to shreds. Differentiation between high and low altitude is accomplished by an ancroid which delays seat release and parachute opening at high altitudes.

What's that you said? You don't have a Martin-Baker seat? Well, welcome to the party. So what's being done for you?

Here Are the Odds

If you eject from straight and level flight between 1000 and 2000 feet with no automatic safety devices, the rec-

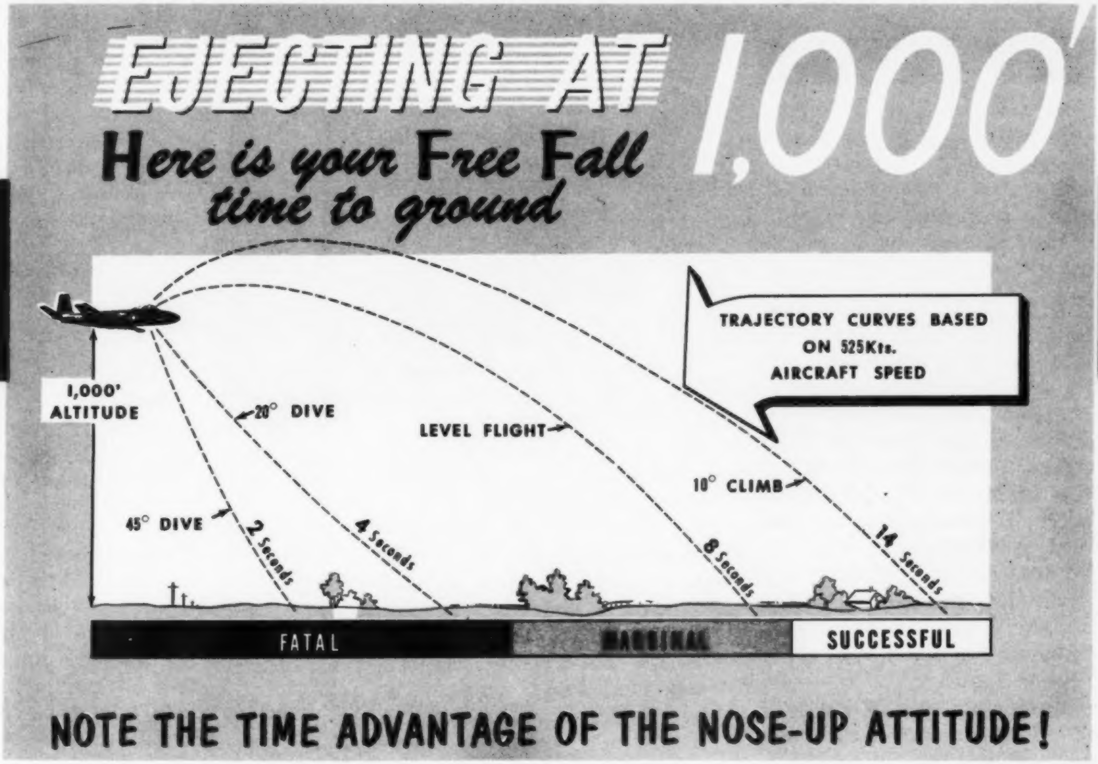


Fig. 1

ords indicate the odds are 4 to 1 in your favor that you'll be around to write up a Pilot's Statement.

Above 2000 feet, it's 12 to 1 that you'll be unscathed.

But below 500 feet, 100 percent of the ejectees have bought the farm when using manual equipment. Human reaction time makes it almost impossible to actuate manual seat belts and pull the rip cord fast enough.

To cut down on this human time element, BuAer has nearly completed a retrofit program for automatic seat belt releases (see pages 30-31, November *Approach*: First use of Automatic Lap Belt), and is rapidly acquiring automatic parachute-opening devices. Uncle is doing this to help you; what can you do to help yourself? Charity (and a lot of other things) begins at home. . . .

First of all, you gotta have a plan of what you'll do in a bad situation. And the first step of such plan is complete knowledge of the airplane so that you can recognize a bad situation without a lot of tomfoolery. You may have to make your decision to go without benefit of a long debate.

Establish in your mind the emergency conditions under which you will eject and mentally rehearse both the conditions and the ejection procedures repeatedly. Decision time, when you aren't prepared, can absorb *more seconds than the entire ejection procedure*—too much time, maybe.

How Long Since . . . ?

How long has it been since you had a dry run in the Pre-Pos - Ox - Pull - Release drill? You really have to know your equipment so you won't be moving like a turtle. If the conditions for ejecting arise and you're prepared by mental practice, you'll probably be riding the silk before you even realize you've ejected!

Continued next page

When you gotta go

Continued

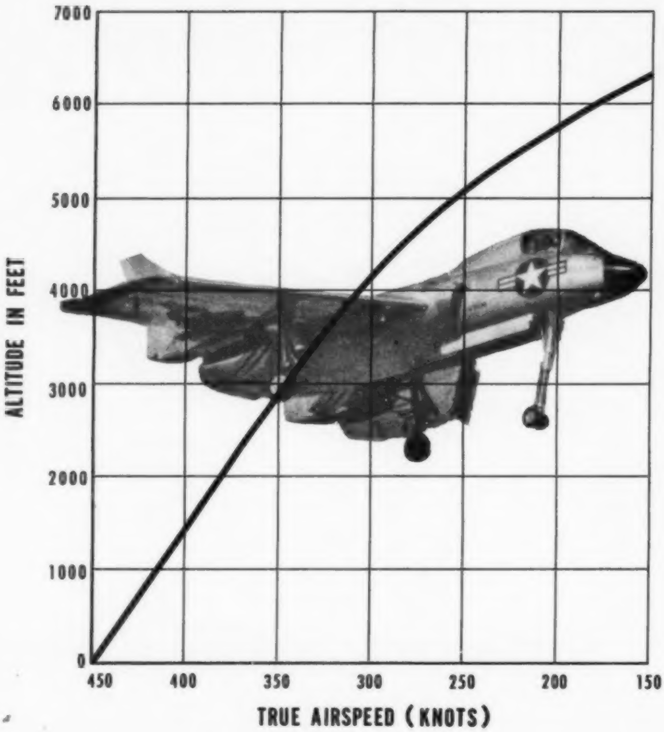


Fig. 2

Even "dirty" in the pattern, if you've got enough speed for a zoom, or enough control for just a mere nose-up, your chances of successful ejection are greatly improved. In the graph, Lockheed Aircraft Corporation engineers have plotted approximate altitude which could be gained in a *power-off, clean configuration* 45-degree zoom. To use the graph, enter on the bottom line with the entry speed of the zoom. Go up vertically from this point to intersect the curve, then left horizontally and note the altitude figure. Re-enter the graph along the bottom at the speed which the ejection is initiated, up to the curve and left to a second altitude figure. The difference in the two altitude figures is the approximate altitude which can be gained in the zoom.

And, right here and now, let's take another word of advice—keep up on the service changes which put new or changed equipment in your airplane's ejection seat firing train. Please don't be hanging on to that face curtain after the automatic seat belt has released you, for instance. . . .

Finally, we said it before and we'll say it again: trade *airspeed* for *altitude* in order to buy *time*.

More than half of the fatal ejections below 2000 feet were at airspeeds well above stall, where the airplane was controllable.

By converting this speed to altitude in a "zoom" pull-up, all of these pilots could have gained at least 2000 feet of altitude which would have given them an excellent chance of survival! In addition, the reduced windblast as they approached the stalling speed would have been to their advantage.

Lockheed's engineers have graphed the "zoom" maneuver for a pull-up into a 45-degree climb, *power off*. Check Figure 2 to see how much altitude you can gain to lift you out of a low altitude ejection.

this speed to the curve, then horizontally to the left-hand margin. Note this altitude. Now re-enter the graph along the bottom line at the speed at which the ejection takes place, go up to the curve again and left to a new, higher altitude. The *difference* between the second altitude and the first one is the approximate altitude that can be gained in a no-power zoom maneuver.

Okay, so you don't have the speed to zoom and you're still down low. What can you do? Pull back on the stick and get the nose of the plane above the horizon!

Your Golden Rule

Here's your Golden Rule for low-altitude ejections: *whenever you have control of the airplane, get the nose above the horizon before you eject.*

If you want to know why mathematically, break out your physics book and study the section on acceleration.

Briefly, it will tell you that you subtract or add the acceleration of your up or down direction of flight to the 32 ft/sec/sec acceleration of gravity times $\frac{1}{2}t^2$.

Now with this educated background, should you eject in a dive, you're going to travel a whole lot farther toward Mother Earth before you get your chute open than you would in the same amount of time if you had your aircraft climbing when you left it. You see, gravity would have to overcome your initial upward velocity before it could start pulling you down.

Buy Time

From the point of view of an ejection seat in space *sans* airplane — this means *time*. Time to do your chores: letting go of the face curtain, tripping the seat belt release if necessary, grabbing hold of the ripcord handle. . . .

Figure 1 will give you a picture of what this means. If you pull the curtain at 1000 feet (and we're not advocating this as any minimum altitude for ejecting) you can see how long it will take you to reach the ground, free fall. The object lesson, sir, is to insure yourself time to get the chute open and stop this free fall business where falling space is scarce.

Less than 4 seconds after you're out of the plane, you'll be at the terminal velocity of your body: below 5000 feet, that's roughly 220 feet/second.

You don't have to be an Einstein to see that at terminal velocity you use up altitude at the rate of a thousand feet every $4\frac{1}{2}$ seconds. So the way you plan to spend those first few seconds, losing *or gaining* altitude without an airplane, is mighty important!

The Payoff

Let's "for example" this situation and again refer to Figure 2. Say you have an airspeed of 250 knots. Four seconds after you eject *from a 20-degree dive* you'll be more than 800 feet below the ejection point. Four seconds after ejecting *from level flight* you'll have dropped only about 80 feet. Those same four seconds after ejecting *from a 20-degree climb,* you'll still be gaining altitude and already be better than 300 feet *higher* than the point of ejection!

You can draw a rough parallel to this by recalling the difference between dive-bombing and loft-bombing.

Experience indicates that an ejection sequence, without automatic belt and chute openers, goes through time as follows:

1 to 2 seconds to eject
5 to 7 seconds to clear the seat and pull the ripcord
2 seconds to deploy the chute
Total time: 8 to 11 seconds

The automatic lap belt cuts this time by approximately 4 seconds. Pull the face curtain to eject and just $\frac{3}{4}$ seconds later, the safety harness and belt release will operate separating pilot and seat. At this point, release the face curtain and let the chair go its own way!

With the full automatic setup that includes the parachute opening device, an ejection below the barometric setting of the chute opener will have the pilot riding in his open parachute in just about 3 to 4 seconds after the face curtain has been pulled!

With the chute in the process of opening, you can readily see why it would be embarrassing for you to be hanging on to the face curtain, sir.

And there's another word of caution on this fully automatic feature: *If* you have unfastened the seat belt manually before ejecting, you have *disconnected* the automatic parachute opener, and must therefore release the parachute by pulling the D-ring!

A last word from the records—too many cases on file where a pilot not equipped with the automatic seat belt release has ejected and pulled the ripcord without ever separating from the seat! Even some of the successful ones have made this mistake of popping the chute while sitting on it, but these "lucky" ones had time to release the safety belt and kick the chair away before riding it into the ground.

Let's sum this all up with what you gotta know when you gotta go:

- **Get the nose of the airplane up**
- **Convert speed to altitude in a zoom**
- **Slow down to near stall**
- **Pull the curtain, remembering that you're going to have to release it**
- **Release the lap belt (if it isn't automatic) *before* you**
- **Pull the parachute D-ring (if it isn't automatic)**

And a frequent review of these procedures can cut seconds off your performance time when seconds really count! •

AND THERE I STOOD

The plane captain was standing between the pilot's and copilot's seats of a UF on a salvage flight. A normal open-sea landing was made on the first swell, but the second swell threw the plane into a nose-down attitude. What happened to him? Here's his report:

"I threw myself down on the deck feet forward, on my back, and hung on to the pilot's and copilot's seats to prevent myself from probably being thrown into the instrument panel. In the future I intend to ride in the radioman's seat on all landings and takeoffs!"

The reporting flight surgeon agrees that this action saved the man from injuries, and recommends that the practice of allowing personnel to stand in the catwalk between the seats during landings and takeoffs be forbidden. The plane captain could be in the radioman's seat, with shoulder harness fastened, or in one of the crew or passenger seats.

It is doubtful that many of our readers have ridden through an open-sea landing. You might say it's sorta like throwing a leg over a wild brahma bull. If you don't hold on tight you are in for a rough ride and an eventual spill. New P-boaters, and perhaps even old hands, may want to review the movies on open-sea landings (MG-1862) and see just how rough it can be even when done by the experts.—Ed.

WHAT DID HE SAY?

This little tale comes from CNAVanTra Flight Safety 22-56. Mumbles had nothing on this guy.

The flight was being conducted at altitude when the instructor heard some strange sounds coming from the front seat. He ascertained that the student was having some oxygen troubles so immediately headed down, indicating that the student should get the mask off. Seems that the bottom segment of the laminar seal had come unglued, expanded and forced its way into the student's mouth. It became lodged under his tongue, making speech impossible and breathing difficult, to say the least.

Prompt action by the instructor in the form of a rapid descent to below 10,000 feet saved a dangerous situation.

SKIN PROTECTOR

Four men attached to a flying squadron developed contact dermatitis of the neck and thighs as a result of wearing cotton *flight clothing* previously treated with a fire retardant compound. This compound consists of a solvent, borax, boric acid, and diammonium phosphate. Ply No. 6A, protective skin cream, was recommended and used with very favorable results.

It is available as an open purchase item, Stock No. GS-03S-17597, in six-ounce tubes and one-pound jars.

duce G-tolerance. To partly prevent this effect it was suggested that the G-suit should inflate at lower G than it does now.

Since fatigue is always the enemy of efficiency, and pending a decision on alteration of the G-suit, pilots who are exposed to prolonged low-G can be on guard.

FOR PILOTS' EYES

The Medical News Letter, Volume 27, No. 12, advises medical officers conducting flight physicals to remember, "the eye and its supporting physiological and anatomical appendages may be adversely affected by fatigue, eye strain, and injudicious celebrations the night before—to mention but a few. It is then advisable to give the individual enough time to put his visual apparatus back into the state of 'normalcy' prior to examination." —"Lack of sleep, excessive eye usage, or indulgence in alcohol the night before may affect true . . . values a great deal."

If you bust your physical temporarily due to the above, maybe your program for the nights before needs altering too!

OVERSTRESSED

Psychological causes for grounding have their warning symptoms, just as physical ills do.

Insomnia is one of these. The individual may doze off, awaken with

Notes from th

BURP

A case of cramps at high altitude shortly after a pilot had a lunch which included a milk shake was reported by the Denver accident prevention board. A sign which lists gas forming foods is being prepared and will be posted in food serving activities.

ACCELERATION AND FATIGUE

A recent national Aero-Medical Association meeting included a short discussion of acceleration in Navy jet fighter aircraft. The conclusions were that even low G-forces, if prolonged, will produce fatigue. Repeated exposure to G on any prolonged flight may also re-

a start, and doze, reawaken, and generally have difficulty sleeping.

So it is a very good thing when the pilot says to the flight surgeon, "Doctor I can't sleep, what can you do for me?" The doctor may give him drugs to induce sleep, and will also note that this may be an early symptom of mental stress. He can

the Flight Surgeon

be on guard if further symptoms develop.

Another indication may be terrifying dreams, particularly dreams involving injury or death to the dreamer, or where the man is unable to land. These dreams may awaken the man, or may lead to the sleep disturbances described above.

This lack of sleep worsens the condition, in a vicious circle.

Medication by the flight surgeon to allow sleep may reverse the condition, with a complete "cure" effected. It may be even necessary sometimes for the flight surgeon to ground the pilot until the stress-causing condition can be alleviated, for a pilot is most vulnerable to an accident during such a period.

EYES THAT WANT TO SEE

Be courteous with your lights.

"There is a growing prevalence of airplane taxiing and parking at night in such a manner as to throw their landing lights across the path of aircraft landing and taking off on the active runway.

"This situation is not good, especially when the landing pilot has kept the lights out in the cockpit for some time before landing in order to get the most effective night vision.

"How about a little discretion being shown your fellow pilot when he is landing or taking off?—*Technical Talk for Pilots*

F9F-8 BAILOUT

After two unsuccessful attempts to fire the ejection seat, the aviator made a successful bailout from his F9F-8 at 6000 feet. The well-trimmed plane glided to a relatively undamaged landing, and tests of the ejection seat showed it to be in working order. Apparently, the pilot had not pulled the face curtain far enough on either of his two attempts.

He also did not pull the manual release pin following the first non-firing. This may be explained by the fact that at his last ejection seat indoctrination, *the training seat did not have the manual pin release mechanism.*

I'M GONNA LEAVE

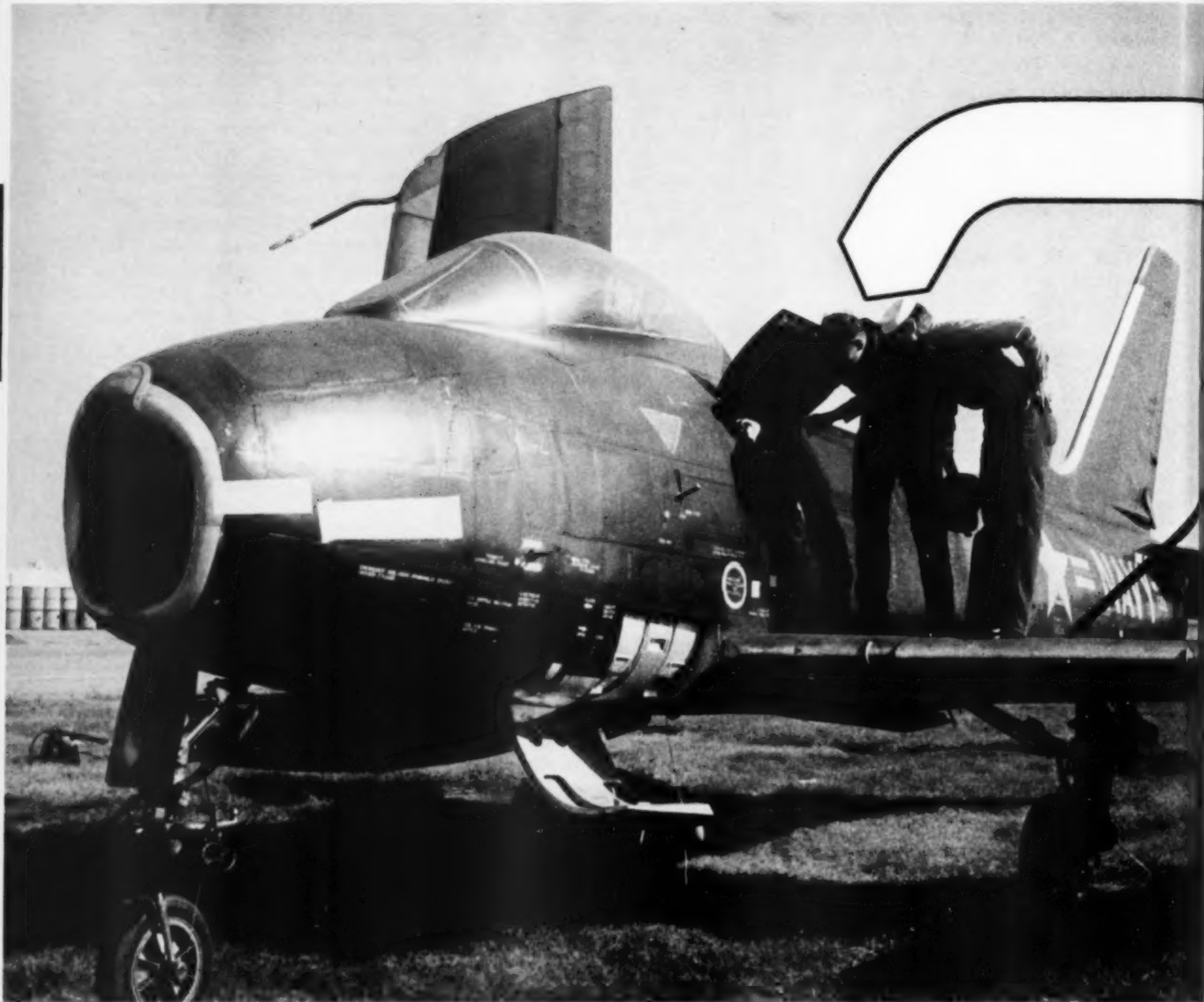
. . . In an accident report the flight surgeon emphasizes the value of training and frequent mental rehearsal of survival techniques. "Again, the decision to abandon the aircraft must be emphasized to pilots. In my short experience, those who do so promptly, survive even though *not one of them I've interviewed went through the procedure perfectly.*

Too often, it's step number one ('I'm gonna leave') that is neglected, and the equipment and training plus a life go for naught."

Please see "When you Gotta Go," page 26 this issue.—Ed.

CHAP STICK TEST

The Aero-Medical Laboratory of the Air Force Research and Development Command reports that the use of anti-chap lipstick under flight conditions of 100 percent oxygen is not likely to be hazardous. There's no need for the Flight Surgeon to ban the use of a chap stick by his pilots when in flight. The test conducted following informal reports of such a situation indicated that in surroundings of high temperature and pure oxygen the ingredients contained in the test item—waxes, fats, and alcohol—do not burn.



In the event of generator failure, the pilot who knows he commenced his flight with a fully-charged battery can plan his emergency procedure with confidence. Here *Fury Three* test pilot Bob Julian talks it over with plane captain E. R. Mobley to get . . .

The INSIDE Story

THE incident which involved Old Pro type naval aviator Lt. Merton D. Short in a *Fury Three* (See Old Pro's inside back cover), demonstrates the importance of a fully charged battery in the event of a generator failure.

Although this happened to an aircraft in which the emergency flight controls are battery-operated, a rundown battery can cause the pilot no end of difficulty in most of our modern aircraft.

Take the case of a TV. Its generator failed with its battery in a weakened condition. The pilot was unable to drop his speedbrakes, could only get 15 degrees flaps, and he couldn't transmit with his UHF. Thereafter, he made two precautionary flameout approaches which resulted in overshoots, but did manage to land safely on his third pass.

During this ordeal he had turned off the battery and most of the electrical gear, turning on the battery only to transfer fuel. Despite these precautions, the battery was dead in the chocks.

There have been other incidents which parallel these and some in which the pilots were less fortunate.. In any case, the point is the pilot shouldn't be deprived of battery power because of the lack of quality battery ground servicing and maintenance.

Let's look at some of the factors which govern battery life.

The battery serves as a reservoir for emergency power, not as a regular supply source. The battery is generally of a small capacity but is subject to heavy loads. That's why the values specified for a state of charge are relatively high.

A battery which may have 50 percent of its charge is considered "low" because a heavy load would soon exhaust it. A battery in a high state of charge will have a specific gravity reading between 1.275 and 1.300; medium at 1.250 and low when it falls below 1.240.

Effect of Sulfation

During the normal operation of a battery a deposit of a whitish scale of lead sulphate forms on its plates during discharge. This process is called sulfation.

Sulfation causes a permanent increase in the resistance of a battery cell. This increased resistance turns electrical energy into heat within the battery and diverts energy which otherwise would go to load units. Excessive heat during charging will also cause buckling of plates.

During the normal life of a battery about 20 percent of its plate material may be shedded and deposited on the bottom of the battery case. This material will eventually cause shorting of the plates and kill the battery.

Please turn page

The INSIDE Story

Continued

Effect of Low State of Charge

A battery can also be ruined if it is allowed to *remain* in a low state of charge. If an airplane is not to be operated for say about a week in moderate temperatures, disconnect the battery and store it. If its reading should fall below 1.240, have it recharged. Undercharge will not only shorten battery life but can also cause damage to the other components of the aircraft's electrical system.

Specific gravity readings are taken with a thermometer-type hydrometer. All readings should be corrected to temperature.

Be sure to take hydrometer tests *before* adding distilled water to the electrolyte. Why? Because time is required for these to mix thoroughly. If you took the test immediately after filling, the hydrometer syringe might suck up a sample which is not representative of the electrolyte as a whole.

Adding Water

The electrolyte level of a battery is maintained by adding distilled water from ⅛- to ⅜-inch above the top of the battery plates. In batteries which have a baffle installed over its plates, electrolyte should be maintained level with the baffle.

Following the testing, the sample should be returned to the particular cell from which it was taken.

Winter operations require additional battery care and precautions, as described elsewhere in this article. But in particular, water should not be added in freezing temperatures unless the battery is to be recharged immediately afterwards. Without recharging, the added water will stay on top of the electrolyte and possibly freeze and crack the battery case. Charging will cause electrolyte and water to mix.

Stabilizer Charging Rate

An excessive charging rate may be the result of an improperly adjusted voltage regulator. A turnup check in the aircraft does not assure you that the voltage regulator will stay

Specific gravity reading of the battery of an S2F is made with a thermometer-type hydrometer by Electrician's Mate A. J. Consentino of VS-30.

Before an aircraft battery is installed, the voltage regulator(s) is checked and adjusted on a vari-drive test stand. Voltage regulation is checked from no-load to full load by C. S. Kielek of FASRon.

within allowable limits throughout a flight.

Before a battery is installed in an aircraft the voltage regulator(s) should be removed from the aircraft, checked and adjusted on a vari-drive test-stand and the load bank of the voltage regulator stabilized at operating temperature.

Voltage regulation from no-load to full-load should be checked according to test procedures for the particular voltage regulator under test. Because some voltage regulators tend to creep upward during warmup, these should be allowed to warm up thoroughly in aircraft before the final adjustment is made. A precision voltmeter Part No. URM-45/PX-14, must be used to make this adjustment.

Leakage Check

Electrical leakage between the case and terminal connection is sometimes caused by seepage of electrolyte between the battery case and its terminal stud. Even though relatively high voltage readings can be obtained with a voltmeter this leakage criteria is not reliable in determining its effect on the life of a battery.

Connect an ammeter between the negative terminal and the case to determine this leakage. If the current measures less than 0.1 amperes, the leakage is not considered serious enough to remove the battery from service.

However, if an aircraft were left idle for two weeks, with its battery connected, this rate of leakage would completely discharge a fully charged battery.

Use of External Power

Use external power sources whenever possible. During extreme cold weather this practice is a must as even the opening or closing of a canopy of an aircraft, on battery power alone, will diminish available battery power to a dangerously low level. Too, a battery in a low state of charge is more susceptible to freezing.

If an airplane is not to be flown in sub-zero weather, remove the battery from the aircraft.

Please turn page

The preflight's incomplete until the battery installation is checked.

Use external power sources whenever possible.

The INSIDE Story

Continued

Preflight Check

The daily preflight check of a battery should include the following:

√ Check the battery case for leakage; condition of sealing compound for splits and melted spots.

√ Check battery for position in mount and for security. Do not overtighten.

√ Check battery terminals for cleanliness and tightness.

√ Inspect leads and connections for corrosion, broken sheathing and security.

√ Check the cell vents for obstructions.

√ Check the battery vent line for pinching.

√ Check battery areas and skin around vent lines openings for acid spillage and spray. Neutralize and clean this area immediately. (Use a sodium bicarbonate solution and rinse with fresh water. Dry with clean cloth).

√ Check battery sump, if installed, for mounting and security of vent line connections. Check the sump jar pad for saturation of the neutralizing agent; make a litmus paper test to determine alkalinity of the sponge.

It has been pointed out that in the event of a generator failure, the pilot should have the advantage of maximum battery life expectancy. By checking the foregoing points, you will insure the pilot maximum battery life.

Since battery life also depends on such factors as when the pilot turns off electrical systems not essential to emergency flight, ambient temperature and other considerations, he has no way of knowing the exact condition of the battery when the generator fails. But, if he knows that the battery was properly serviced and maintained before flight, he will be able to plan his emergency procedure with a high degree of confidence.

Note: For more details on battery maintenance and service, the following references are recommended:

Battery Troubles, Electronics Digest Jan 1956

Aircraft Battery Maintenance, Electronics Digest May 1956

Nickel-Cadmium Battery Charging Techniques, Electronics Digest July 1956

EMB 7-54 Aircraft lead-acid storage batteries and battery shops

67-54 Aircraft electrical, hazardous conditions or damage to electrical system in connection with application of external DC power, precautions to be observed.

13-56 Aircraft electrical, operation, inspection and maintenance procedures for aircraft lead-acid type storage batteries

18-56 Aircraft electrical, information concerning nickel-cadmium type storage batteries

EMC 147-54 Aircraft electrical, Battery Quick-Disconnect 51A-1B23, and Battery Quick-Disconnect Adapter E 1967, installation of

From the Ground Up

Notes and Comments on Maintenance

REVERSED POLARITY—Shortly after being catapulted an F7U continued climbing out ahead of the ship with its landing gear down. The aircraft reversed course, returned to the ship and commenced orbiting with its landing gear still extended.

After all attempts to establish communications with the aircraft were unsuccessful, the aircraft flew by the ship, rocked its wings and departed toward land about 45 miles away. Four minutes later the pilot ejected and the aircraft crashed. Twenty-five minutes had elapsed since takeoff.

Investigation revealed that the start power cables were reversed on the terminals inside the ship's deck-edge receptacle box. This condition caused reversed polarity of the fields of both aircraft DC generators, which in turn, caused the loss of generator output. Battery power under these conditions would be depleted in about 4 minutes. The complete electrical failure stopped the fuel transfer pumps, causing fuel starvation of the engines.

CHECK OUT—After an HSL helicopter in storage status was started for a preservation run-up, the watch started to walk away to get an inspector. He heard a noise and turned around to see what was happening. He was struck by debris from the helicopter which had turned over and caught fire. He received a compound fracture upper left arm.

The crewmember starting the plane had failed to place the two hydraulic boost system handles in the ON position. After engaging the clutch and starting to advance the throttle the collective pitch engaged. The aft section of the aircraft began to rise, snapped the rear rope tie-downs, rolled forward about three feet, then continued until the forward part of the aircraft went up on its nose then over on its back.

The crewmember had been checked out by his supervisor but had limited experience (only two previous turn-ups in this model).

Recommendations include:

Provide adequate tiedowns when other than pilots are to ground test helicopters (OpNav Inst. 3710.7, Sect. VI, 17d.).

Crewmembers, including non-pilots, use the safety equipment available in the aircraft.

More on next page

FROM THE

GROUND UP

CONTINUED

HEAD 'EM OFF AT THE PASS—Once upon a time (not too long ago either) there was an intrepid airman all set to leap in his F-86D.

He was lined up on the runway making his pre-takeoff check when things started to happen. Because of some malfunction, the after burner eyelids only opened ¼ of the way, and kapow!—a hair raising explosion occurred, followed in short order by a fire warning light, followed in very short order by the pilot who made like a gazelle as he leaped out of the now burning plane. In his haste, he just didn't quite get the throttle all the way off and the "dawg" started to roll.

After two complete circles on the runway, it straightened out and headed straight for the ramp, barely missing a large transport type aircraft, and lined up just right to clobber a whole row of parked fighters. It is assumed that the tower or somebody alerted the Fearless Fire Fighters that there was some business for them because by this time, everybody was in the act! Three fire trucks and one jeep were flying close formation with the 86, the ramp personnel were throwing chocks, stands, fire bottles, and master sergeants with over 30 years service under the wheels trying to get it to stop.

In the meantime, back at the ranch, two of the fire trucks were foaming the heck out of the airplane on the run trying to put out the fire and not doing too well. The third fire truck and a jeep driven by the Accident Investigation Officer (a boy who really believes in prevention) got ahead of the plane with the avowed purpose of ramming it to a screeching halt if necessary. Luckily, a fleet-footed young lieutenant of unimpeachable courage leaped upon the wing as it went by and stop-cocked the throttle. The beast was brought to a halt, and the fire trucks extinguished the blaze.

It seems a shame, but somebody had to send out the Twx on the accident, and we'll bet it was the poor old Accident Investigating Officer.—*ARDC "Contrails."*

CAVEAT EMPTOR—Non-compliance with R-3350 Engine Bulletin 455, dated July 1955, which prescribes a flexible tube for primer of the AD model aircraft, resulted in an accessory section explosion and minor injuries to a line crewman.

The accident occurred during start. The pilot turned on BATT & GEN, ran engine through 16 blades then turned gas ON, fuel boost ON, hit primer and put mags on BOTH.

The engine fired a few times, then quit. The lineman gave a "flooded" signal. The pilot let off on the primer but continued pulling engine through. After a few more coughs, an explosion occurred which blew off the cowling. The port cowling struck the lineman.

A broken primer line tube assembly to the priming tee caused this ground accident. The aircraft had flown 19.7 hours since acceptance check after receipt from overhaul.

In case you've forgotten, "Caveat Emptor," is Latin, meaning "Buyer Beware."

BIG BOAT BOOTS—A possible safety-to-flight hazard was reported when the deicer boots of a P5M-1 ballooned on takeoff. It was determined that poor technique used to apply deicer boot cement was the cause of the failure of the cement.

Spreading the cement too thin by spray application, allowing too much time to elapse between activation of the cement and the time the boot is attached, improper temperature, the lack of

humidity control and the absence of the services of an expert technician, appear to be factors in improper boot installations.

BuAer expects this problem will be solved when P5M Service Change 377 becomes effective. This change covers the removal of old Type-20 spanwise boots and replacement with Type-21, -22 chordwise high pressure boots. These boots will be installed with a new cement, Minnesota Mining EC-1403, without the use of metal retaining strips.

In the meantime, as P5Ms are phased through overhaul, a careful reinstallation of the boots with Goodrich R-575-T cement is being accomplished. Further, BuAer is issuing a directive to all activities operating P5Ms to conduct a careful visual check of the deicer boots. This check is to be made while operating in flight at least every 90 or 120 hours to detect any ballooning effect on separation of the boot from the attaching surface.

AD ENGINE TROUBLES—A recent study of O&R reports from Alameda and Norfolk show that 36 articulating rods have broken or failed in R3350-26WA engines during the 6-month period ending 1 July 1956. This indicates probable non-compliance with the correct clearing-engine-procedures and improper starting techniques by maintenance personnel and pilots. The correct procedures are clearly outlined in the flight handbook for AD aircraft and in General Reciprocating Engine Bulletin number 79.

During the same period, 19 engine failures were attributed to master rod bearing failures. It is suspected that many of these failures were directly caused by the lack of pre-oiling, or incomplete pre-oiling, as prescribed in the R3350-26WA Service Instructions ANO2A-35JG-2.

BuAer letter Aer-PP-415/91 of 16 August 1956 is quoted for information: "As an aid in prevention of engine failures where bearing failures of oil starvation are listed as cause, it is directed that the intervals between oil changes and main oil strainer cleaning periods be reduced. Pending issue of a revision of T.O. 37-54, engine lubricating oil will be changed at a maximum of 60 hours; and the main oil strainers will be cleaned at no greater intervals than every 15 hours. T.O. 37-54, paragraph 5, which directs a report to BuAer (PP-5) stating the reason for oil change, need not be complied with."

The large number of engine failures indicate a need for all operators of AD aircraft to review their procedures and to insure strict compliance with current directives.

More briefs next page

SETTING THE STAGE—

ACT I

Scene I: A CVA somewhere on the briny deep. Jet fighters are being recovered. An F2H is in good position, takes the cut and drops toward the deck.

Voice from cockpit: *Yeow!*

Scene II: The *Banshee* slams into the deck blowing both tires.

2nd voice (narrator in somber tone): "After establishing his sink rate the pilot was unable to check it by flaring out. *The control stick grip came off in his hand.*"

Scene III: Cloud of steam envelops overheated pilot who rages off to readyroom waving control stick grip.

ACT II

Scene I: Close-up of typewriter: keys flying. Message is seen as roller moves to left. "Effective immediately, all control stick grips will be added to preflight inspection by plane captains!"

So, it shall be.

FROM THE

GROUND UP

CONTINUED

ELECTRONIC POTENTIAL — Lockheed Aircraft Corporation, having conducted actual tests with the AN/APS2O E Radar, has come up with the following findings:

- It ignited dry steel wool at a distance of 45 feet.
- It caused sparking among a mixture of aluminum chips which exploded a gasoline vaporair mixture at a distance of 251 feet.
- It set off photo flash bulbs at a distance of 850 feet.
- It caused audible and visible sparking among metallic chips shaken in a paper bag at a distance of 275 feet.
- Pronounced humming was produced by medium aluminum wool at 300 feet.

Fueling and defueling operations should not be conducted wtihin 275 feet of the radar beam, measured from the antenna, when the set is operating at full power. This likewise applies to the existence of fuel in open containers. Calculations have indicated that the 275-foot fueling distance may be reduced to 130 feet providing the set is operated at low power.

In the event that it is necessary to operate the radar set at full power on the ground for short periods of time, and the above mentioned safe distances cannot be maintained, the antenna should be fixed and held at a designated clear azimuth.

Warning signs and flashing lights should be placed at conspicuous spots around the aircraft as a warning that the radar set is in operation. Lockheed Aircraft Company also inserts removable pipe railing with chains at the 130-foot radius to keep the fuel trucks and other unauthorized vehicles and people from entering the danger zone.

Particular attention must be paid to housekeeping conditions because of the electrical arcing associated with the operation of the radar. This includes trash, metal scrap, oily rags, steel wool, etc.

The radar beam will not penetrate metal, so there is no hazard existing to fuel while in the tank truck.

In the event the above distances cannot be maintained with respect to fueling and defueling operations to adjacent aircraft, it appears that fine mesh metal screens set at a 45-degree angle to the ground could be used to deflect the radar beams upward. (See Navy Technical Order 46-54 dated December 14, 1954).

Ground personnel are not permitted closer than 35 feet from operating radar antennae. The Lockheed Medical Department is presently conducting annual physical examinations of all employees exposed to radar hazards. This includes careful eye examinations involving the use of a slit lamp by an opthalmologist. Up to now, nothing of any significance has been detected in the people examined. However, people with metal implants should not be exposed to radar beams because of the thermal heating effect.

ELECTRICAL POWER FAILURE—Five minutes after takeoff in an F7U-3 and at an altitude of 25,000 feet the pilot experienced a complete electrical power failure. Then, five minutes later the pilot secured the starboard engine believing the loss of temperature and RPM a flameout. Two unsuccessful airstarts were attempted to relight the starboard engine at 15,000 and 5000 feet.

The aircraft struck some wires, cut down several trees and landed in an open field due to inability to reach the landing field. The cause was an electrical failure.

The investigation revealed that both batteries had been subjected to a condition which caused them to boil over, presumably by a defective starboard voltage regulator in which the carbon piles were pitted and fused. On bench check, regulator voltage went to 35 volts. The port generator was found to have no output voltage.

The AAR Board also noted that the pilot failed both to properly evaluate his emergency and to set himself up for a modified flameout to single engine approach.

It is recommended that all maintenance personnel read the F7U-3 Electrical Sytem article appearing in the July 1956 issue of the Naval Aviation Electronics Digest.

dar.
teel

so
the

be
ing
hat
gle
dar
46-

ser
ae.
tly
all
in-
the
Up
een
ver,
ex-
nal

fter
000
ical
ilot
oss
un-
ght
eet.
wn
to
use

ries
sed
ive
oon
ck,
ort
ge.
ilot
ncy
to

er-
icle
val

ch

Murphy's Law*

* If an aircraft part can be installed incorrectly, someone will install it that way.

BROKEN RECORD

A fighter squadron's record of over 6000 hours and 2 years of accident-free flying fell when the squadron became a victim of Murphy's Law. Further, the accident again proved that a short cut can completely nullify the long-standing team efforts of many.

During a busy day of flying, a hydraulic leak had been reported in the right main gear of one of the squadron's F9F-7s. The squadron's only hydraulics man replaced three seals—all in bad condition—of the gear-up lock system. However, in reinstalling, he connected the up-lock lines *in reverse*.

This hydraulics man, an AMA School grad with 30 months practical experience in the squadron, experienced no difficulty in reinstalling the lines. The first line went directly into place. So did the second. (See Photo A.) This accomplished, the up-lock lines were pressurized for a leak test, and let go at that as all the squadrons jacks were in use and pressure was on him for the aircraft.

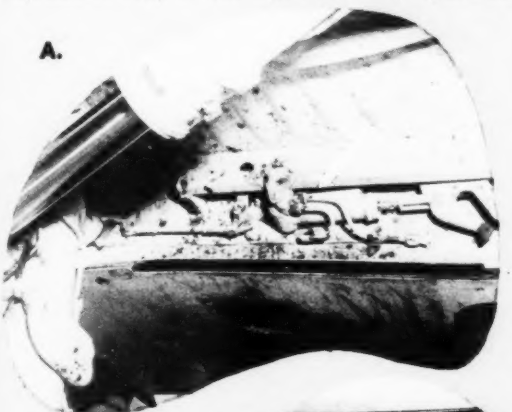
On the takeoff, following this repair, the pilot retracted the gear but it would not indicate UP and LOCKED. The gear was up but the landing gear door was open. This prevented depression of the microswitch which is necessary for an UP and LOCKED indication.

After the pilot attempted to cycle the gear several times, the starboard gear remained UP. Normal procedures failed to lower the gear, so the emergency landing gear extension air bottle was actuated. The starboard gear, however, remained UP. After the fuel load was reduced to 2400 pounds, an approach was made with speedbrakes, landing flaps, tailhook and only the nose and port gear extended. A level attitude was maintained until the emergency arresting gear was engaged. The aircraft stopped in a short distance and sustained only minor damage.

To eliminate this "Murphy," the accident board recommended that either different type fittings or color markings be used to distinguish the up-lock lines.

Reviewing authorities also called attention to Technical Order 2-48 which requires a functional test including cycling of *any* hydraulic system component which is disconnected, replaced, or has its lines removed or partially disassembled on any aircraft. At any rate, in the absence of proper equipment for a functional test, a thorough inspection must be accomplished by the engineering officer.

A.



B.

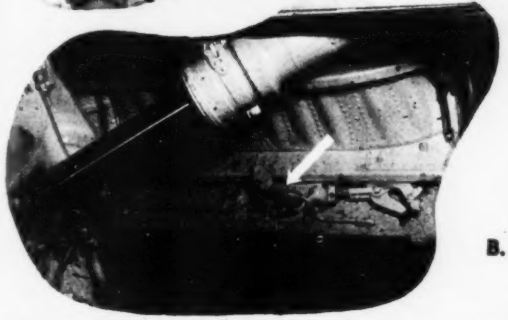


Photo A: (top) The mech experienced no difficulty in reinstalling the lines in reverse.

Photo B: Shows correct connection of hydraulic lines to up-lock cylinder.

the Tip-tank

Miscellaneous aviation safety information

NEW UHF CHANNEL

Many air force bases now have a direct airground UHF channel for weather data. Pilots can use this facility by calling on 344.6 mc. AFBs having this service are shown in the "Remarks" column of the Radio Facilities Chart by the abbreviation "PFSV."

BRAKES vs. DRAG

In the various discussions about brake effectiveness versus aerodynamic braking on landing (raising flaps to help brake action by putting more weight on wheels) it is assumed that the pilot would touch down at the correct airspeed.

Two F9F-7 accidents happened in one month when the aircraft touched down 20 to 30 knots too fast. Braking was started immediately which caused overheating of the brakes at such excessive speed; flaps were up or raised to get better action but the brakes were already overheated. Pulling of the emergency air bottle then, likewise, did no good since the brake discs were already red hot.

The Marine Training Command Bulletin spells out the recommended technique for their reserve squadrons: "Come in at the right approach speed, touchdown on main gear (105-120 knots for F9F-6, -7) depending on weight, hold nose off until speed is down to 80 knots without dragging tail, let nosewheel down and then use the brakes as required.

"For pilots in doubt as to length of brake application, use them ON for 2 seconds, OFF for 1 second, then ON 2 seconds. If the runway is wet or icy, brake action will be improved by raising flaps after slowing to 80 knots. If it appears that the emergency air bottle will be required, the decision to use it should be made before overheating the brake discs with long pedal application."

One of those bits of hangar-flying, "once-heard-but-dimly-remembered" explained excess airspeed this way: For every knot of excess speed over the fence the landing roll will be lengthened a proportionate amount. The type of airplane and the exact amount of extra runway length for each knot is unfortunately the part of this pilot lore that is dimly remembered. It might be of interest to individual squadrons to dig a little deeper into this element of the landing.

NAS Denver 31 Aug 56

UNDERSTATEMENT OF THE MONTH

A mid-air collision can spoil your whole day. (Follow the rules, quadrantal separation is better than none.)—*Flight Safety Foundation*

CORRECTION

The announcement of the Chief of Naval Operations Safety Award winners on page 3 of December *Approach* and in the "Weekly Summary" of 22-28 October 1956 contained an error. It was incorrectly reported to Naval Aviation Safety Center that VA-722 was the CNAResTra single-piloted, propeller squadron with the best safety record. This should have been VA-772 at NAS Los Alamitos. Congratulations to VA-772 for an outstanding aviation safety performance during Fiscal Year 1956.

DEFENSIVE FLYING

"Failure of one plane to follow the prescribed flight pattern in approaching the field was cited in a CAB report as a contributing factor to two collisions which occurred last year. CAB cautions that the prescribed pattern on approach be followed because that is where the other pilot expects you to be. Of equal importance is that the other fellow may not be so careful, therefore safety dictates that you be on the lookout for the pilot who does not follow flight pattern regulations."—*Flying*

ATTENTION: CRASH CREWS

Many safety crash crews of squadrons ashore are already using the new, large-type fire rescue truck, the MB1—delivered to them in answer to the overflow of requests to replace worn-out FFN-5 vehicles. And these streamlined trucks are doing wonders.

BuAer is working feverishly to handle orders for a small-type truck or what is now classified MB5 model. The demand for these is growing because most old FFN-1, -2, and -3 jobs are rapidly headed for scrapping.

The newer model should be ready now. Only final tests for automotive effectiveness and fire fighting capacity remained when this information was received.

Repeat requests are not necessary as the Bureau knows your needs. It estimates that in less than one year as many as 80 percent of the inadequate older models will give way to the newer MB5.

FURY TIPS

In-flight refueling procedures for the FJ-3 are briefly covered in North American Aviation *Service News* of 31 August 1956.

Written by George Hoskins, Engineering Flight Test Pilot, the article summarizes techniques used by NAA pilots when refueling FJ-3 aircraft from AJ tankers. See your NAA rep for copies.

OLD PRO CLUB

Merton D. Short, Lt., USN

Aircraft: FJ-3, VF-21

Experiencing an engine seizure 10 miles at sea, Lt. Short displayed excellent judgment in determining that he had sufficient battery power to maintain control of his FJ-3, and altitude enough to reach a landing field. He had knowledge of the battery condition prior to takeoff, had observed the generator output during the flight and rapidly estimated the drain on the battery to operate the flight controls until his landing could be effected. He glided 43 miles to an air station, made a flame-out approach and landed the aircraft without further damage.

Please see "The Inside Story" on page 38.—Ed.

Frank X. Nibler, AD2

Aircraft: A3D-1; VAH-1

Nibler was crewman in an A3D-1 which experienced failure of the starboard landing gear to lower. After the pilots, CDR P. E. Wilson and LCDR E. A. Heflin, had exhausted all auxiliary and emergency procedures to lower the gear, Nibler tore a large hole in the aft bombay bulkhead with a pair of pliers. He then beat the starboard landing gear into the down and locked position with the butt end of a wing jury strut. The landing which followed was without damage.

Charles H. Tall, III, LTJG

Aircraft: ZSG-4, AIRSHIPRON ONE

Taking off from a touch-and-go landing in a ZSG-4 airship, LTJG TALL discovered that his elevator was locked. By trimming the airship tail-down, he was able to climb to 500 feet, but was unable to free the elevator. He therefore ballasted the airship slightly statically heavy so as to have more complete altitude control during a landing approach. The static weight he chose would give him sufficient weight for control and light enough so that if the airship stalled in close to the ground, the landing gear would not sustain damage. He also figured how much ballast he would have to drop to become statically light to effect a safe waveoff. Then, without the elevators and using the air system of the airship for altitude and trim control, he established a smooth rate of descent and landed without damage to the airship and with minimum danger to the crew and to the ground handling party.

Recognition of heads-up flying is essential to a positive program of flight safety. Each month, Approach will acknowledge certain selected individuals whose exhibited flying ability merits membership. Old Pro's also receive a wallet membership card as a memento of the occasion. Commanding officers are invited to submit nominations for selection.

WELL DONE!

LCDR T. L. Roberts, LT Ed Havel, LT C. H. Toumela, CDR B. Barrett and LCDR Joe Sneden

A much deserved "WELL DONE" was earned on the night of 12 September 1956 by the USS TARAWA (CVS-40), and in particular by Comdr. Bayntan Barrett, CIC officer; Lt. Comdr. J. S. Sneden, Assistant Air Operations officer; Lt. Comd. T. L. Roberts, VFAW-4 pilot airborne from TARAWA in an AD-5; and Lt.(jg.) E. F. Havel, VS-32 LSO embarked in TARAWA. The accomplishment for which TARAWA and her crew are commended was the night recovery of an F2H-3, from another carrier unit, that was about to ditch due to fuel starvation.

The incident started when Lt. C. H. Tuomela of VF-41 took off in a *Banshee* from NAS Oceana to rendezvous with the USS FORRESTAL at sea for night carrier refresher landings using the mirror landing system. The *Banshee* failed to get aboard the FORRESTAL after several attempts, and was instructed to return to Oceana. By the FORRESTAL's computations, there was enough fuel in the aircraft to make the flight. However, a higher fuel consumption en route made it apparent to Lt. Tuomela that he would never reach the beach and would have to ditch or eject at sea. So he started broadcasting "Mayday."

At this time, TARAWA was conducting night carquals 40 miles east of Oceana. This was unknown to the *Banshee* pilot. Lt. Comdr. Roberts had been launched from TARAWA and intercepted the Banshee's "Mayday." Lt. Comdr. Roberts relayed the distress information to TARAWA and established voice contact with the F2H.

Four minutes after being alerted of the jet in distress, TARAWA had a ready deck, was increasing speed to maximum, had advised the plane-guard destroyers of the new situation; increased the tension on the arresting gear to receive the jet aboard, and was providing UHF/DF steers to the pilot who was now positive he could not make the beach and was grasping for straws.

Lt. Comdr. Roberts was also taking DF steers on the *Banshee* and the confirming steers from the AD-5 and from Comdr. Barrett in TARAWA's CIC brought the jet over the ship in less than 5 minutes, with about 300 pounds of fuel remaining.

On a suggestion by Lt. Comdr. Sneden, TRARAWA's searchlight was directed up like a bright candle. This enabled the jet pilot to quickly locate the ship beneath him, and he immediately started a landing pass.

TARAWA is an axial deck, support carrier. Lt. Tuomela had never landed on a straight deck carrier before, and hadn't made an LSO directed approach in five months. Lt.(jg.) Havel, the LSO, had never brought a jet aircraft aboard any carrier. And this was a "one-shot" deal; the pilot informed the ship that he could *not* take a waveoff!

Lt.(jg.) Havel saw the aircraft approaching the groove and picked him up with a "Roger," observing the plane still descending, working for good altitude. He also observed a blinking approach light and shouted to his talker: "No hook!"

But Lt. Comdr. Sneden, below decks in TARAWA, was also sweating out the landing, and in his own mind, ran over things he might do to help the pilot make this one approach good. The hook flashed through his mind also, and called over guard frequency: "*Banshee*, check your hook."

So, just as Lt.(jg.) Havel was about to give a no-hook waveoff, the approach light came on steady; Lt. Tuomela hearing Lt. Comdr. Sneden's transmission had just time to slap the hook handle into the DOWN position, take a high dip and a cut! The *Banshee* engaged number 6 wire, rolled to a stop on the centerline, and flamed out from lack of fuel.

This perfect teamwork in a rapidly developing emergency situation earns for "all hands" in TARAWA a very WELL DONE!*

** It should be noted that all-hands efficiency is not just a one-shot affair. The carrier recently received a 1956 Chief of Naval Operations Aviation Safety Award.—Ed.*

en

he
uel

A's
his
ath

ola
nd
hs.
aft
he
ff!
ve
ne
ob-
er.

as
an
ne
so,
ur

ok
ola
to
a
6
out

er-
ry

ust
55
.